**APPENDIX A**
**Geophysical Investigation Report**

TRC

April 28, 2003

Ms. Kristie Wilkie
TRC
5052 Commercial Circle
Concord, CA 94520

Subject: Geophysical Investigation
Georgia Pacific Lumber Mill
90 West Redwood Avenue, Fort Bragg, California

Dear Ms. Wilkie:

This report presents the findings of a geophysical investigation performed at the subject address in Ft. Bragg, California. The investigation was conducted over eight days during the period of March 10 through 21, 2003. The work was performed by NORCAL Geophysicists Dan Jones and David Bissiri and Geophysical Technician Travis Black. Site orientation and background information were provided primarily by Ms.Kristie Wilkie and Mr. Jeff Hunter of TRC.

## 1.0 PURPOSE

TRC is performing an assessment of the Georgia Pacific Lumber Mill at the subject address. This lumber mill dates back to the early 1900's. Although the lumber mill is no longer in operation, there is still a limited amount of operational and maintenance work being performed by a small crew of Georgia Pacific employees at the site. The purpose of the geophysical investigation was to obtain subsurface data that will aid in determining the locations of suspected underground objects from both past and present use. Suspected objects include such items as underground storage tanks (USTs), buried debris, railroad spurs, utilities, and other miscellaneous targets. It is our understanding that this information will be evaluated for consideration of follow-up investigations by TRC.

## 2.0 SITE DESIGNATION

The property is bordered on the south and west sides by the ocean and cliffs. Redwood Avenue (Highway 1), as well as miscellaneous commercial and residential properties, comprise the eastern boundary. TRC defined 13 geophysical survey areas within the property limits. These areas are designated as Sites 1-13, according to the order in which they were investigated. Their general locations are depicted on the Geophysical Survey Index Map (Plate 1), an adapted version of an aerial photo of the property provided by TRC. This map also includes parcel designations used by TRC. The sites with area names based on general site locations, are listed below. Following the site name in parentheses are the nearest TRC-investigated areas (prefixed with "TRC"), as found on TRC's orientation maps.

Site 1: Sheep Barn Area (TRC - 8.4)
Site 2: Machine Shop Area (TRC 3.13)
Site 3: Mobile Equipment Shop Area (TRC 5.5)
Site 4: Scrap Metal Area (TRC - 9.2)
Site 5: Northwest of Fuel Storage Building (TRC - Northwest of 5.11)
Site 6: Sawmill No. 2 (TRC - 7.1)

Site 7: Southeast End of Landing Strip (TRC - 8.1)
Site 8: Area East of Shipping Office (TRC - East of 6.4)
Site 9: Shipping Office Area (TRC - 6.4)
Site 10: Northeast of Fuel Barn (TRC - North of 4.7, 4.9, 4.10)
Site 11: Former Bunker Fuel AST Area (TRC - 4.2)
Site 12: Glass Beach No. 3 (TRC - Parcel 1, Westernmost Point)
Site 13: Southeast of Pond (TRC - 5.2)

## 3.0 GEOPHYSICAL INVESTIGATION

### 3.1 Methods

We performed the geophysical investigation using five geophysical methods: magnetic (MAG), electromagnetic terrain conductivity (TC), electromagnetic line locating (EMLL), hand-held metal detection (MD) and ground penetrating radar (GPR). The MAG method was used to identify localized magnetic variations due to the presence of buried ferrous metal objects. These objects may include USTs, transformers, utilities, buried railroad spurs, and miscellaneous metallic debris (such as metal-bearing construction debris like reinforced concrete). The TC method was used to delineate both natural variations in soil conductivity and man-made variations produced by metallic objects and debris. It was also used to delineate zones of non-metallic material within back-filled areas. The EMLL method was used to locate common utilities (e.g. electric, telephone, water, natural gas) and to aid in interpreting the MAG and TC data. We used the MD method to investigate for shallow metal objects, to further define the limits of potential targets identified with the MAG method, and to provide information in areas where magnetic interference from surficial objects (such as buildings and metal signposts) may have compromised the effectiveness of the MAG method. Finally, we used GPR to investigate a selection of suspicious MD-identified objects to further define their size and nature. Detailed descriptions of these geophysical methods including the associated instrumentation and limitations can be found in Appendix A.

### 3.2 Location Control

Prior to proceeding with the geophysical investigation at each site, we established a survey grid to provide location control and ensure complete coverage of the survey areas. These survey grids were based on a rectangular northing and easting coordinate system. Grid points were typically marked on the ground surface with spray paint on 10-by-10-foot centers. We used this grid to accurately position MAG and TC survey traverses and to assist in mapping the results.

### 3.3 Data Acquisition and Analysis

Using the survey grid as a guide, we obtained TC and MAG data along traverses oriented parallel to the long axis of each survey area. The traverses were spaced either five or ten feet apart (depending on the site conditions) with data stations spaced every five feet along each traverse. Due to both limited physical access and instrumental interference caused by above ground cultural objects, the limits of the TC and MAG surveyed area could only extend to within approximately 10 feet of above ground obstructions. Differences in data collection procedures and physical accessibility with the TC and MAG instruments resulted in slightly different survey limits in some instances for the two methods.

Following the MAG and TC data collection, a preliminary data analysis was performed. Contour maps were generated in the field to monitor data quality and to analyze the initial results. We used EMLL and MD instrumentation to scan for buried utilities and/or other metallic objects that might represent the source(s) of any anomalous variations not attributable to known sources. Initial scanning consisted of conducting bidirectional traverses over suspicious MAG and TC variations. The traverse spacing was variable depending on the observed response in the area. We also scanned the perimeters of the MAG and TC survey areas as well as any remaining portions of each site with the MD and EMLL instrumentation on a 10-foot and a 20- to 50-foot grid, respectively. In some cases, exploration for subsurface targets was extended beyond the designated investigation limits to further delineate detected utilities or to better resolve other detected objects. There is no recorded data to analyze for the MD and EMLL methods. The locations of detected subsurface items were marked on the ground surface with spray paint as the surveys were conducted.

We performed GPR traverses over a selected number of targets identified by the other methods. These targets include those of significant size or suspicious character, for example UST-shaped MD anomalies. We analyzed the resultant GPR profiles for reflection patterns suggestive of USTs and underground utilities.

We documented all of our findings on a scaled field map before leaving each site. We also provided faxed copies of the preliminary field results to TRC for review throughout the period of field work. Final analysis and data presentation were completed in our Petaluma, California office. A full description of the data analysis procedures for the various methods is provided in Appendix A.

## 4.0 RESULTS

The results for each site are presented on the Geophysical Survey Maps for Sites 1-13, on Plates 2-14 respectively. The survey maps show the locations of all detected and interpreted items. In general, the survey results defined five types of subsurface features interpreted to represent buried objects: 1) MAG anomalies, 2) TC anomalies, 3) MD anomalies, 4) GPR anomalies, and 5) utilities. General information regarding these features are discussed below:

(1) MAG anomalies represent areas of suspected buried metal, based on the contour maps. These are typically areas where we did not resolve metallic objects with the MD equipment, thereby implying that the source(s) of the anomaly may be deeper than the detection limits of the MD equipment (4-6 feet). Although, in some cases, there may be coincident or adjacent utilities, however, our interpretation of the MAG response suggests that additional undocumented metal objects are likely present at these locations. The MAG anomaly boundaries may be significantly larger than the physical dimensions of the buried object or objects. The source is typically found near the center of the anomaly. In some cases, the source may be one localized object, in others it may be a grouping of buried metal objects.

(2) TC anomalies not clearly associated with utilities typically represent a significant change in subsurface materials such as in excavated and backfilled zones, as well as areas of buried objects. As with the MAG results, there may be coincident utilities, however, our interpretation of the TC response indicates additional undocumented items/features at these locations.

(3) MD anomalies represent buried metal objects occurring less than four-to-six-feet beneath the ground surface. These objects can vary in size from something as small as a manhole cover to a large reinforced concrete pad. In some cases, MD anomalies shown on the maps are rectangular with sizes consistent with that of USTs. However, the limits of the anomalies shown on the maps may in some cases be slightly larger than the subsurface objects themselves, particularly with the smaller anomalies. Therefore, the anomaly size may not be directly representative of the size of the source object.

(4) GPR anomalies identify the locations of buried objects and may represent the source of coincident MAG, TC, or MD features. The limits of these anomalies are relatively close to the areal breadth of the subsurface source unless otherwise noted.

(5) Detected underground utilities include electric (E), fire suppression (FS), compressed air (CA), storm drain (SD) and undifferentiated (UU) lines. Undifferentiated utilities are utilities or pipes of an undetermined type or use. In some cases, the detection of these utilities ended abruptly as indicated with termination marks or question marks. It may be possible that some of these utilities continue along the same alignment but were no longer detectable with our instruments due to alterations in composition, depth changes, or interference from above ground objects. Also, in a few cases, the entire alignment of a utility is questionable due to faint instrument response or interference from cultural items. These utilities are shown with question marks along their entire length. Where we have reason to believe the utility is of a particular type, but could not definitively confirm it, we have annotated the labeled type with a question mark (e.g. FS?). Also, some utility alignments are annotated "ND" for Not Detected. These alignments were typically determined from visual inspection of in-line valves or pipes entering and exiting the ground surface bu not detected by the geophysical instruments.

Additional items shown on the survey maps include the following: above ground cultural objects, the approximate limits of our investigation areas, and the GPR traverses. The above ground objects are shown for location reference and as an indication of possible sources of interference. The MAG and TC Contour Maps used to determine the interpreted locations of the MAG and TC anomalies shown on the survey maps are included for reference in Appendix B. Site features from the Geophysical Survey Maps have been overlain on these contour maps to help correlate the observed variations with surface features and detected objects.

### 4.1 Site-By-Site Discussion

The results for each geophysical survey area are discussed below on a site-by-site basis. This includes a brief site description, the primary purpose of the survey, and a short discussion regarding the location and our interpretation of the potential sources of detected subsurface features.

#### 4.1.1 Site 1: Sheep Barn Area (TRC - 8.4), Plate 2

This area measures approximately 250 feet east/west by 300-to-400 feet north/south (Plate 2). It is an open area covered mostly by soil and wood chips. The primary purpose of the survey was to search for an area where transformers were reportedly buried. Typically, a cache of buried transformers would be expected to provide a significant magnetic response. Also, the terrain conductivity response from such a target would be significant due to the excavation and backfilling required to bury such objects.

We did not detect any areas consistent with the expected response of a cache of transformers buried in the shallow subsurface. We did detect one undifferentiated utility aligned approximately northwest/southeast. This utility appears to be in two segments with an approximately 20 foot break in the middle. Toward the west end of this utility, a small MD anomaly was detected, typical of very small debris.

#### 4.1.2 Site 2: Machine Shop Area (TRC - 3.13), Plate 3

This is an asphalt-covered area measuring approximately 20-to-30 feet east/west by 105 feet north/south (Plate 3). It is located between a machine shop (to the east) and a set of railroad tracks (to the west). The primary purpose of the survey was to search for any potential USTs and associated/undocumented utility lines.

We detected one 5-by-15 foot MD anomaly toward the north end of the survey area. The dimensions are consistent with those of an approximately 1000-gallon UST. Unfortunately, the nature of the buried object responsible for the MD response could not be confirmed using GPR. The subsurface metal object may lie deeper than the detection capabilities of the GPR in this area. There are two smaller MD anomalies shown on Plate 3, one immediately south of the larger anomaly and another to the east. The nature of these anomalies remains unknown, they could represent small debris. A north/south trending undifferentiated utility occurs between the railroad tracks and the large MD anomaly. We also detected storm drain lines trending east and south from a catch basin and a compressed air line toward the south end of the survey area.

#### 4.1.3 Site 3: Mobile Equipment Shop Area (TRC - 5.5), Plate 4

The survey area measures approximately 80 feet east/west by 175-to-205 feet north/south (Plate 4). It is a gravel-covered lot, bordered by a mobile equipment shop to the east, a tire shop to the south, a down-sloping surface to the west (not shown), and an asphalt road and pond to the north. The MAG and TC methods were not used in the northernmost 35 feet of the survey area, since this portion was added subsequently, after the MAG and TC survey areas were completed. The primary purpose of the survey was to search for any potential USTs and associated/undocumented utility lines.

We detected four isolated MD anomalies labeled A-D and several utilities. Anomaly A is in the road along the north edge of the survey area and is coincident with a circular asphalt crack. Therefore, it may represent the location of a paved over manhole cover/valve cover or other small object. Anomaly B occurs along the west edge of the survey area and is irregularly shaped. It may represent miscellaneous metal debris. The remaining two MD anomalies, C and D, are rectangularly shaped and measure approximately 4-by-9 feet and 5-by-5 feet, respectively. The size of C is approximately consistent with that of a small UST (550-1000 gallon?). However, our review of GPR profiles from traverses over this object showed some GPR reflection characteristics of a UST, but not the completely typical GPR signature of an intact UST. Therefore, we were unable to definitively verify whether this object represents a UST. Anomaly D occurs in the southeast portion of the survey area and partially overlaps a utility corridor. This anomaly may therefore be related to these utilities and represent a covered pull-box or some other object beneath the utilities.

The detected utilities include several undifferentiated utilities originating above ground at the northwest corner of the mobile equipment shop. Also there is a short east/west segment in the center of the survey area and one crossing the road to the north. A fire suppression line trends east/west through the center of the survey area.

#### 4.1.4 Site 4: Scrap Metal Area (TRC - 9.2), Plate 5

This area measures approximately 180 feet east/west by 60 feet north/south, crossing the main asphalt road into the property (Plate 5). The majority of the site is an open field with one set of overhead lines trending north-south in the eastern half of the site. The purpose of the survey at this site was to search for a north-south trending scrap metal disposal area, reportedly on the east side of the road.

We detected one small (2-by-2 foot) MD anomaly probably representing miscellaneous debris and one undifferentiated utility in this area, but no indications of a scrap-metal disposal area. We also identified a TC anomaly near the bend in the utility. This anomaly is an approximately 10-to-15 foot elliptical area that may represent fill material.

#### 4.1.5 Site 5: Northwest of Fuel Storage Building (TRC - NW of 5.11), Plate 6

This area measures approximately 170 feet east/west by 90 feet north/south (Plate 6). It occurs at the "T"-intersection of two asphalt roads, with a gravel covered area to the west. There is a fire hydrant to the north, two utility poles and associated guy wires to the south, and a moveable stop sign toward the northeast corner. The primary purpose at this site was to identify utilities trending through the area.

We detected one fire suppression and three undifferentiated utilities trending through the site. One of the undifferentiated utilities appears to terminate at its north end within the survey area, as shown. We also detected two sets of what we believe to be north-south trending subsurface railroad spurs toward the west edge of the survey area. These are shown as 6-to-7 foot wide elongated metal detector anomalies on Plate 6. One is within the survey limits, and the other occurs just west of the survey limits as shown.

Other detected features at the site include a small, 3-by-5 foot, MD anomaly toward the northwest corner of the survey area and three MAG anomalies. The MAG anomalies occur alongside or between detected utilities. These anomalies may therefore be associated with the utilities, however, based on our interpretation of the MAG results we believe there may be additional buried metal in these areas.

#### 4.1.6 Site 6: Sawmill No. 2 (TRC - 7.1), Plate 7

The designated survey area measures approximately 80-by-80 feet. It is located between two buildings with several overhead conveyors trending through the area (Plate 7). There is a fire hydrant/valve box and a loading rack immediately north of the survey area. Due to the extensive above ground metal at the site, we did not use the MAG method. It was anticipated that the conveyors, etc. would cause overwhelming interference. It should also be noted that although the TC data coverage was limited to the area within 80 feet of the building to the east, the MD and EMLL coverage extended to the western building. The area is asphalt-covered, however, exposed concrete and significant asphalt cracks are visible adjacent the eastern building. The primary purpose of the survey was to search for any potential USTs and associated/undocumented utility lines.

We detected seven localized metal detector anomalies, labeled A-G on Plate 7. Anomaly A is an irregularly shaped area near the western building. Our interpretation of the GPR records from traverses over this feature confirmed the source of this MD anomaly as subsurface reinforced concrete. Anomaly B is a small area measuring approximately 2-by-3 feet, south of Anomaly A. MD Anomalies C and D are two rectangularly shaped areas adjacent to each other, each measuring approximately 6-by-7 feet. Anomaly E is a 12- to 15-foot diameter circular area south of the fire hydrant and adjacent to a concrete support for an overhead conveyor. Anomaly F is a small, 3-by-3 foot area near the building to the southwest. The sources of anomalies B-F are unknown.

An approximately 50-foot diameter circular MD anomaly, labeled G, was identified. It appears to be a reinforced concrete wall of some kind. Within this circle, we detected three GPR anomalies. Our interpretation of GPR profiles from this area suggests that these GPR anomalies may represent lightly reinforced concrete pipes with 4-5 foot diameters, however other sources are possible. We observed a rather weak metal detector response over these objects, which typically rules out the presence of metal USTs.

In addition to the metal detector and GPR anomalies, we detected the fire suppression line trending west from the fire hydrant/valve box. Visual inspection of a valve box south of the survey area (not shown) suggests that there is a fire suppression lateral trending north-south as well. Additionally, we believe there may be a small lateral to the eastern building from a small vertical pipe adjacent to the fire hydrant. We also detected what appears to be a utility corridor trending east/west just south of the fire suppression line from the valve box to the western building. This corridor may continue to the east. However, we could not detect it further to the east than shown on Plate 7, possibly because its depth beneath the ground surface increases beyond the limits of the MD instrument.

#### 4.1.7 Site 7: Southeast End of Landing Strip (TRC - 8.1), Plate 8

The survey area measures approximately 60 feet east/west by 150 feet north/south (Plate 8). It occurs immediately east of the intersection of an east/west trending asphalt road and the south end of the asphalt airstrip. The ground cover north and south of the asphalt road is bark and soil, respectively. The primary purpose of the survey was to search for any potential USTs and/or buried debris.

We detected only two very small metal detector anomalies in the vicinity of the survey area. These probably represent localized small, metal debris. No indications of significantly sized debris or USTs were detected.

#### 4.1.8 Site 8: Area East of Shipping Office (TRC - East of 6.4), Plate 9

The survey area measures approximately 150-by-150 feet. It is approximately centered on a TRC boring location marked with a stake labeled "P6-15" (Plate 9). The ground surface is mostly gravel, with an asphalt road to the east and a six-foot-wide asphalt path to the south. There is a pile of stacked wood near the southeast corner and a telephone pole with guy wires near the northeast corner. The primary purpose of the survey was to search for any potential USTs and associated/undocumented utility lines.

We did not detect any features typical of a UST within the limits of the survey area. We identified the locations of five utilities, including four undifferentiated lines and one suspected storm drain line. Two of the undifferentiated lines appear to terminate abruptly within the survey area as shown. We also detected two suspected subsurface railroad spurs trending northeast/southwest, labeled as MD anomalies A and B. One of these (B) is continuous throughout the survey area and the other (A) appears to be a shorter segment, approximately 30- to 35-feet long. We observed a valve (covered with a metal plate) near the TRC stake. This valve may be related to the adjacent utility. Toward the south end of this utility, there is an irregularly shaped MD anomaly (C) which may represent a piece of pipe or miscellaneous debris. A large TC anomaly with relatively high conductivity was observed in the center of the survey area. This anomaly probably represents a change in material properties and may represent an excavated/backfilled zone, an increase in soil moisture, or related to a former building foundation "footprint". The two utilities that trend through this anomaly may also have contributed to the conductivity high.

#### 4.1.9 Site 9: Shipping Office Area (TRC - 6.4), Plate 10

The survey area extènd north and east of Building 6.4 (the Shipping Office). It has maximum dimensions of 120 feet east/west and 160 feet north/south (Plate 10). The Shipping Office is located on the southeast corner of a former building foundation comprised of reinforced concrete that measures 57-by-78 feet. There is a concrete apron along the north edge of this foundation. Aside from the foundation, the survey area is asphalt covered with a drainage ditch trending approximately north/south through the eastern half of the area. There is a telephone pole in the east-central portion of the area and one at the southeast corner. Another site feature along the west boundary is a 4-by-5 foot steel pull box and an adjacent valve (beneath a circular pull-box). The primary purpose of the survey was to search for any potential USTs and associated/undocumented utility lines.

We detected two undifferentiated utilities extending through the limits of the survey area, one trending approximately east/west and the other north/south. The east/west alignment trends next to the aforementioned pull-box and suspected valve. There is also an exposed storm drain culvert near the northeast corner.

We detected two adjacent GPR anomalies west of the northern telephone pole as shown with cross-hatched shading. Our review of the GPR profiles in this area revealed GPR reflections suggestive of a north/south trending segment of pipe for the western anomaly. The GPR characteristics of the eastern anomaly were more ambiguous and the nature of this object could not be determined.

#### 4.1.10 Site 10: Northeast of Fuel Barn (TRC - North of 4.7, 4.9, 4.10), Plate 11

The survey area is an approximately 180-by-30 foot rectangular area north of the power house. It is oriented with its long axis running east/west along a gravel road (Plate 11). The western limit occurs north of the entrance to the Fuel House (Barn). There is an overhead conveyor diagonally crossing the eastern half of the area and another running east/west approximately 20 feet north of the survey area. A chain-link fence enclosing a transformer pad is located approximately six feet south of the eastern half of the survey area. Other site features in the vicinity of the survey area include a telephone pole, various utility vaults/valve boxes, and fire hydrants. The primary purpose of the survey was to search for undocumented utility lines.

We detected numerous utilities within the survey area. These include electric, fire suppression and undifferentiated utility lines. Where the existence of a line is questionable due to a faint or ambiguous instrument response, we have annotated the line with question marks. Where a "utility corridor" is shown, we believe multiple utilities may exist within the same alignment. Of specific note are three pipes entering the ground surface at the northeast corner of the fuel barn. Georgia Pacific personnel informed us that one of these is an in-use fuel oil line that runs north to an AST shed. The other two pipes were reported to run north to the wastewater treatment building. We did not detect any of these three lines and therefore could not mark out their specific alignment. Due to the number of utilities in this area, it is possible that there are other lines we could not detect due to interference from adjacent lines.

In addition to the utilities, we detected three localized metal detector anomalies. Two of these are relatively small, of irregular shape, and probably represent miscellaneous metallic debris. The third MD anomaly, however, is a rectangular area just south of the designated survey limits measuring 8-by-13 feet. The results of the GPR profiles traversing this anomaly were inconclusive and we were unable to determine the source of this anomaly. It may lie deeper than the detection capabilities of GPR in this area, estimated at 2-to-3 feet.

#### 4.1.11 Site 11: Former Bunker Fuel AST Area (TRC - 4.2), Plate 12

The survey area is an "L"-shaped area on the north and east sides of the water treatment building. It has maximum dimensions of 260 feet east/west and 100 feet north/south (Plate 12). The area is grass-covered, with very tall grass throughout much of the site and cattails east of the building. There is a shorter grass area approximately 18 to 28 feet north of the building with visual evidence of a former railroad line, observed as decayed railroad ties. There are four concrete footers with embedded I-beams at the west end of this shorter-grass zone. Toward the southeast corner of the survey area there are exposed pipes and steel reinforcing bar. Also in this area is a wooden valve box with exposed water(?) lines. There is a hill sloping up to the north along the north edge of the survey area where a water tank and the fuel oil AST shed are located (not shown).

This site is the location of former bunker fuel ASTs. The primary purpose of the survey was to search for utility lines and other features that may have been associated with the ASTs. The uneven terrain and tall grass increased the difficulty of this survey.

We located numerous utilities/pipelines throughout the survey area. These include electric, water, fuel oil, and undifferentiated utilities. The undifferentiated utilities include two near the southwest corner of the survey area, one of which may represent a water line serving a nearby fire hydrant (not shown); two lines trending east-west near the northern survey limit, one at the east end and one at the west end; one additional segment about 45 feet northeast of the building; and three partially exposed lines at the southeast corner. The electric line runs north/south approximately seven feet east of the building. The water lines include a metal line serving the water treatment building from a water tank to the north and a set of non-metallic laterals intersecting a wood valve box near the eastern edge of the survey area. We did not detect the latter set of water lines due to their non-metallic nature, but they were exposed east and south of the valve box and there may be a lateral to the west as well, heading toward the water treatment building.

A fuel oil line is known to trend through the survey area, the same line exiting the northeast corner of the fuel barn at Site 10. However, the non-metallic nature of this line precluded its detection. We have shown its approximate alignment based solely on visual observations of its entry and exit points at the ground surface.

In addition to the utilities discussed above, we detected two MAG anomalies and one TC anomaly, north of the building. The sources of these anomalies are undetermined. As is typically the case, the subsurface objects responsible for these anomalies are probably much smaller than the lateral extent as shown.

#### 4.1.12 Site 12: Glass Beach No. 3 (TRC - Parcel 1, Westernmost Point), Plate 13

The survey area measures approximately 180 feet east/west by up to 120 feet north/south. It is located on a point of land surrounded on the west, south and north sides by steep cliffs dropping off to the ocean (Plate 13). There is partially exposed, extremely rusted metal debris toward the northwest corner of the survey area, off the side of the cliff. The primary purpose of the survey was to locate buried debris zones.

We detected a TC anomaly with relatively high soil conductivity in the central west portion of the site. It may represent a landfill disposal area. We also detected one MAG anomaly toward the northwest corner of the site. It is in the vicinity of the exposed metal debris and probably represents additional buried metal debris in the area. Finally, we identified four metal detector anomalies representing shallowly buried, miscellaneous metal debris.

#### 4.1.13 Site 13: Southeast of Pond (TRC - 5.2), Plate 14

The site is an irregularly shaped open area bordered by a gravel road to the north and an asphalt road to the east and south (Plate 14). There are three storm drain catch basins within the survey area, two toward the southwest corner and one at the extreme northeast corner. There is also a pile of stacked wood in the center of the survey area. The primary purpose of the survey was to identify potential buried debris zones and possibly former building foundations.

We detected two MAG anomalies, labeled I and II. To the west, MAG anomaly I may represent one isolated object, based on contour shapes and spacings. Immediately east of MAG anomaly I, MAG anomaly II covers a larger area and is interpreted as possibly representing a scattered debris area containing multiple buried objects. We also detected several small MD anomalies interpreted as representing shallowly buried, miscellaneous metal debris. One of these MD anomalies occurs within the limits of MAG anomaly II.

We identified several utilities trending through the survey area. These include two linear, approximately north/south oriented undifferentiated utilities, and a non-metallic storm drain exiting into the pond. We also identified an irregularly curving, suspected utility line annotated with question marks in the eastern half of the survey area. Although this line is metallic, its non-linear nature suggests that instead of a utility line, it may be some other type of abandoned metal debris.

## 5.0 SUMMARY

Numerous subsurface objects related to, or suspected to be related to, past and present uses of the site were detected within the survey areas. These objects include utilities such as fire suppression, electric, fuel oil, storm drain, and undifferentiated lines. Besides the utility lines, various MAG, TC, and MD anomalies were also detected. The exact sources of most of these anomalies could not be determined, but we have made an effort to suggest possible sources based on the observed responses with the different geophysical methods. A review of historical information regarding the locations of these anomalies may provide additional insight into potential sources of these anomalies. Depending on the importance of these locations with regard to the purposes of TRC's site assessment, we recommend considering invasive investigation methods to definitively determine the anomaly sources.

## 6.0 LIMITATIONS

In general, there are limitations unique to each geophysical method employed for this investigation. These limitations include maximum depths of investigation for each method. Also, each method relies on a significant contrast in physical properties between the background soils and the object or feature of interest in order to detect it. Each instrument also responds differently to above or below ground cultural features such as utilities, fences, and debris. These features may cause interference, which can limit the effective detection of subsurface objects/features in the immediate vicinity. A more detailed discussion of the limitations with regard to each of the geophysical methods employed for this investigation is presented in Appendix A.

## 7.0 STANDARD CARE AND WARRANTY

The scope of NORCAL's services for this project consisted of using geophysical techniques to characterize the subsurface. The accuracy of our findings is subject to specific site conditions and limitations inherent to the techniques used. We performed our services in a manner consistent with the standard of care ordinarily exercised by members of the profession currently employing similar techniques. No warranty, with respect to the performance of services or products delivered under this agreement, expressed or implied, is made by NORCAL.

We appreciate having the opportunity to provide you with our geophysical service.

Respectfully,

NORCAL Geophysical Consultants, Inc.

Dan P. Jones

Dan P. Jones
Geophysicist, GP-1042

DPJ/jm

| | | |
|---|---|---|
| Enclosure: | Plate 1: | Geophysical Site Index Map |
| | Plates 2-14: | Geophysical Survey Maps |
| | Appendix A: | Geophysical Methods |
| | Appendix B: | MAG and TC Contour Maps |


## LEGEND

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|---|---|
| **1** | GEOPHYSICAL SURVEY SITE (1–13) |
| | PARCEL DESIGNATIONS (1–10) |

SCALE

0 250 500 1000

(1 inch = 500 feet)

NORCAL

GEOPHYSICAL SURVEY INDEX MAP
90 WEST REDWOOD AVENUE
GEORGIA PACIFIC LUMBER MILL

LOCATION: FORT BRAGG, CALIFORNIA

CLIENT: TRC

JOB #: 03-244.36

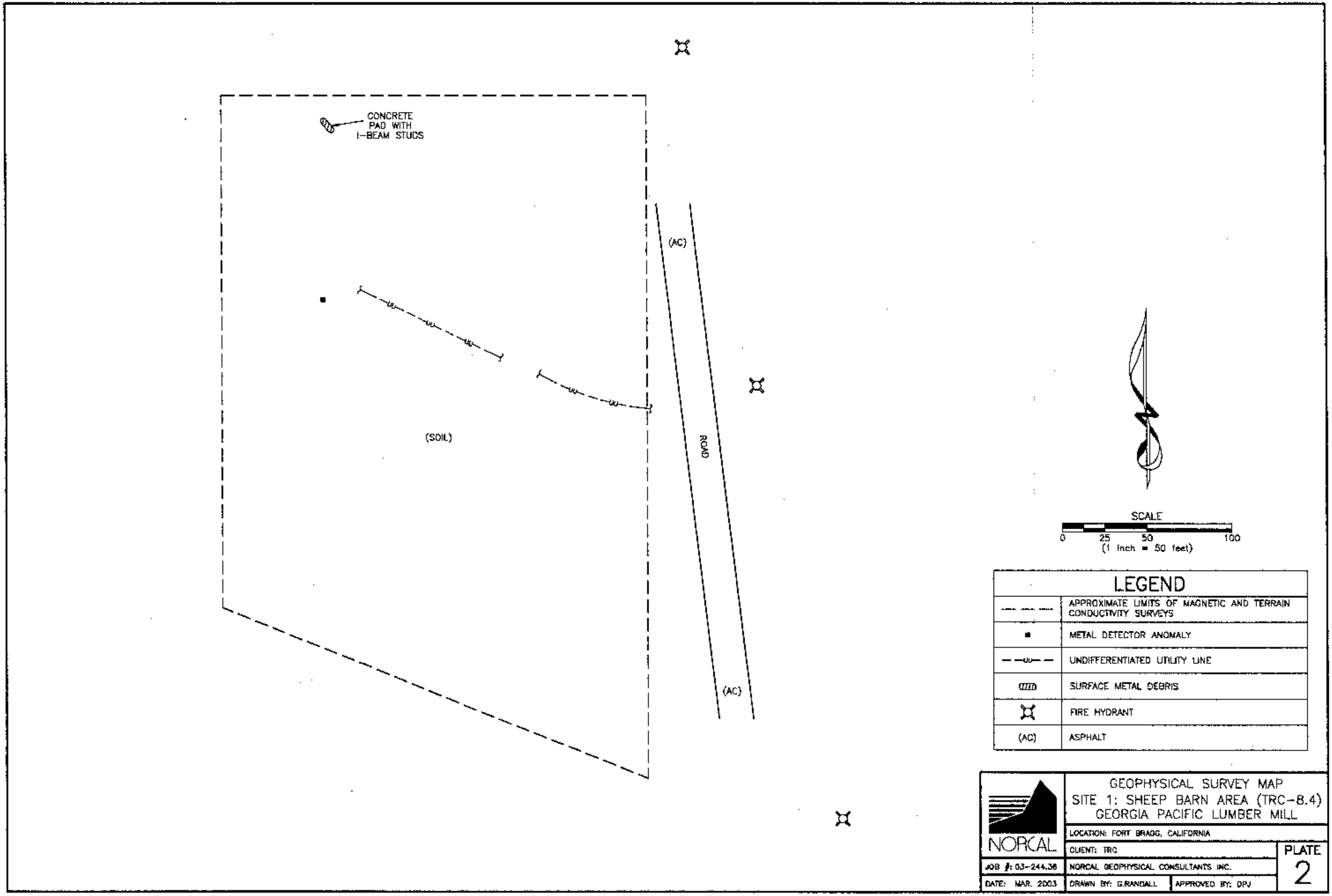
NORCAL GEOPHYSICAL CONSULTANTS INC.

DATE: MAR. 2003

DRAWN BY: G.RANDALL

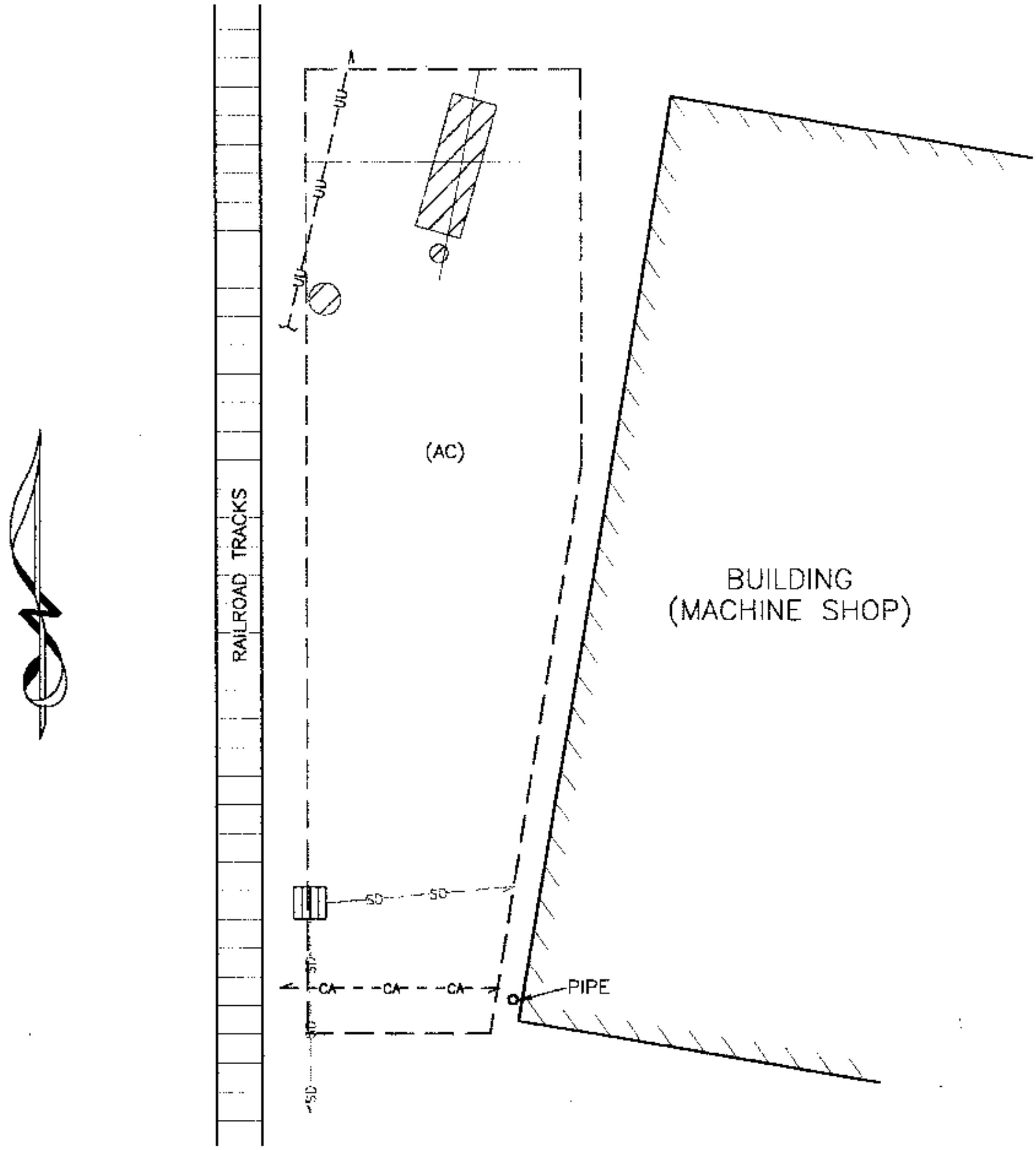
APPROVED BY: DPU

PLATE 1




| LEGEND | |
|---|---|
| — — — | APPROXIMATE LIMITS OF MAGNETIC AND TERRAIN CONDUCTIVITY SURVEYS |
| ■ | METAL DETECTOR ANOMALY |
| — —UU— — | UNDIFFERENTIATED UTILITY LINE |
| | SURFACE METAL DEBRIS |
| | FIRE HYDRANT |
| (AC) | ASPHALT |

| | | |
|---|---|---|
| NORCAL | GEOPHYSICAL SURVEY MAP<br>SITE 1: SHEEP BARN AREA (TRC-8.4)<br>GEORGIA PACIFIC LUMBER MILL | |
| | LOCATION: FORT BRAGG, CALIFORNIA | |
| | CLIENT: TRC | PLATE 2 |
| JOB #: 03-244.36 | NORCAL GEOPHYSICAL CONSULTANTS INC. | |
| DATE: MAR. 2003 | DRAWN BY: G.RANDALL / APPROVED BY: DPJ | |




## LEGEND

| | |
|---|---|
| — — — | APPROXIMATE LIMITS OF MAGNETIC AND TERRAIN CONDUCTIVITY SURVEYS |
| ——— | GPR TRAVERSE |
| | METAL DETECTOR ANOMALY |
| — -CA- — | COMPRESSED AIR LINE |
| ----SD---- | STORM DRAIN LINE |
| — —UU— — | UNDIFFERENTIATED UTILITY LINE |
| | CATCH BASIN |
| (AC) | ASPHALT |

SCALE
0 10 20 40
(1 inch = 20 feet)

NORCAL

GEOPHYSICAL SURVEY MAP
SITE 2: MACHINE SHOP AREA (TRC–3.13)
GEORGIA PACIFIC LUMBER MILL

LOCATION: FORT BRAGG, CALIFORNIA

CLIENT: TRC

JOB #: 03-244.36

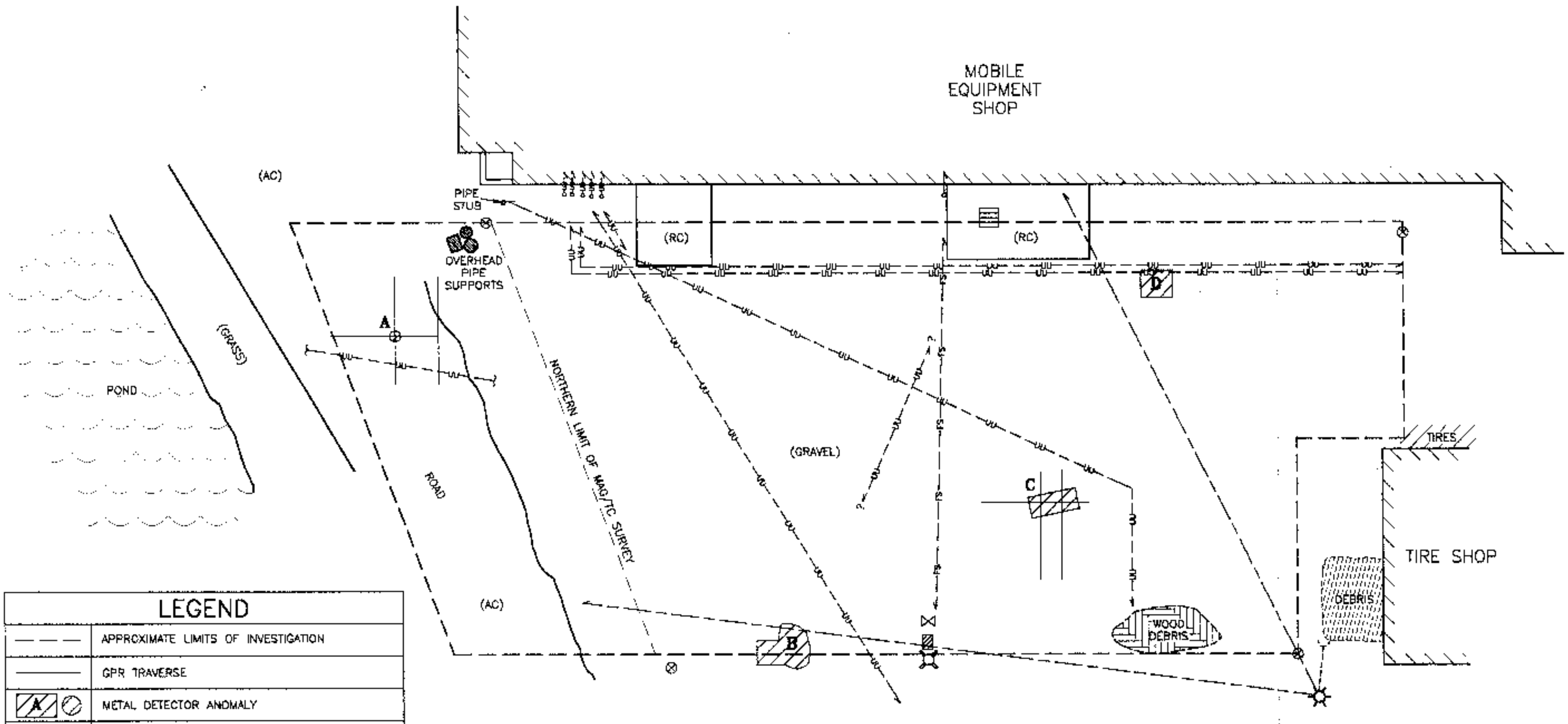
NORCAL GEOPHYSICAL CONSULTANTS INC.

DATE: MAR. 2003

DRAWN BY: G.RANDALL

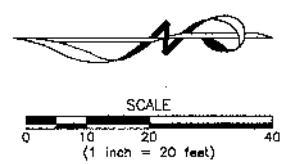
APPROVED BY: DPJ

PLATE 3




## LEGEND

| | |
|---|---|
| — — — | APPROXIMATE LIMITS OF INVESTIGATION |
| —— | GPR TRAVERSE |
| A ⊘ | METAL DETECTOR ANOMALY |
| — —FS— — | FIRE SUPPRESSION LINE |
| — — — | OVERHEAD UTILITY LINE |
| — —UU— — | UNDIFFERENTIATED UTILITY LINE |
| | SURFACE METAL DEBRIS |
| | CATCH BASIN |
| | FIRE HYDRANT/HOSE BOX/STAND-UP VALVE |
| ⊗ | TRC STAKE |
| | UTILITY POLE/GUY WIRE |
| (AC) | ASPHALT |
| (RC) | REINFORCED CONCRETE |

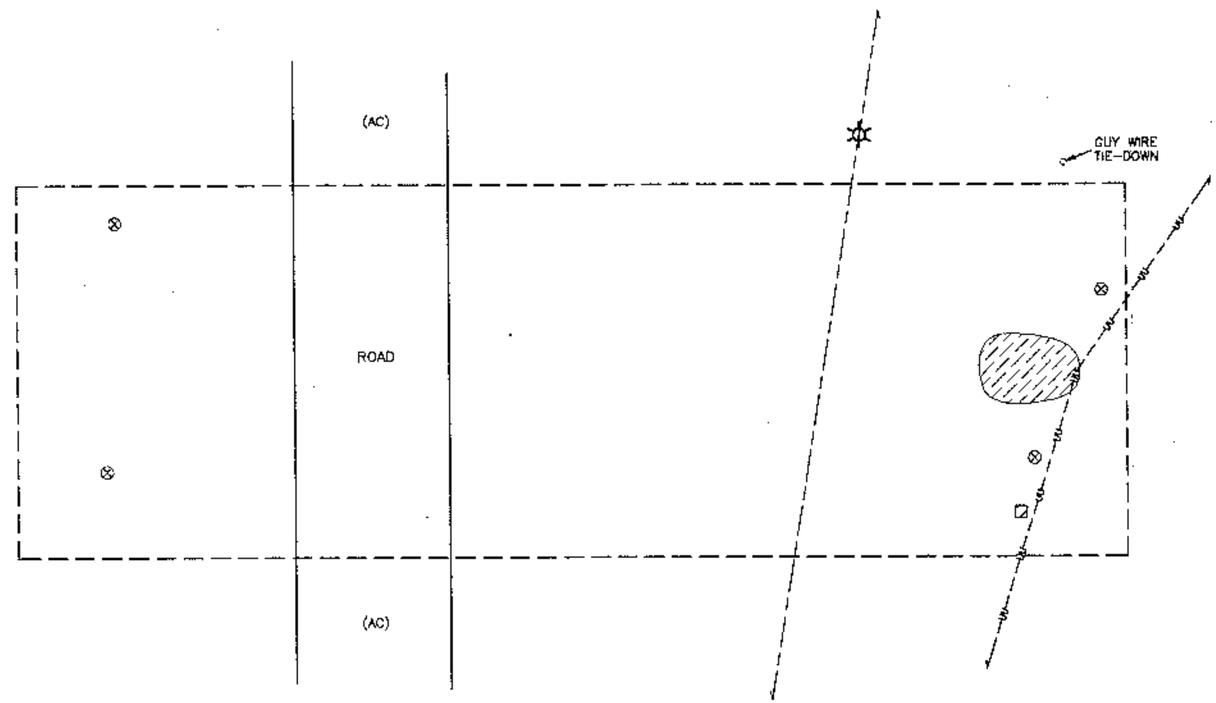


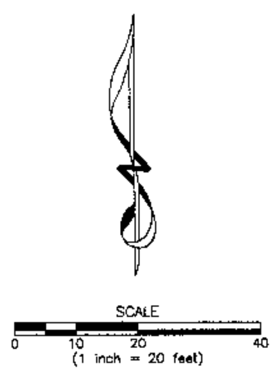

GEOPHYSICAL SURVEY MAP
SITE 3: MOBILE EQUIPMENT SHOP AREA
(TRC-5.5)
GEORGIA PACIFIC LUMBER MILL

NORCAL

LOCATION: FORT BRAGG, CALIFORNIA
CLIENT: TRC
JOB #: 03-244.36
NORCAL GEOPHYSICAL CONSULTANTS INC.
DATE: MAR. 2003
DRAWN BY: G.RANDALL
APPROVED BY: DPJ

PLATE 4

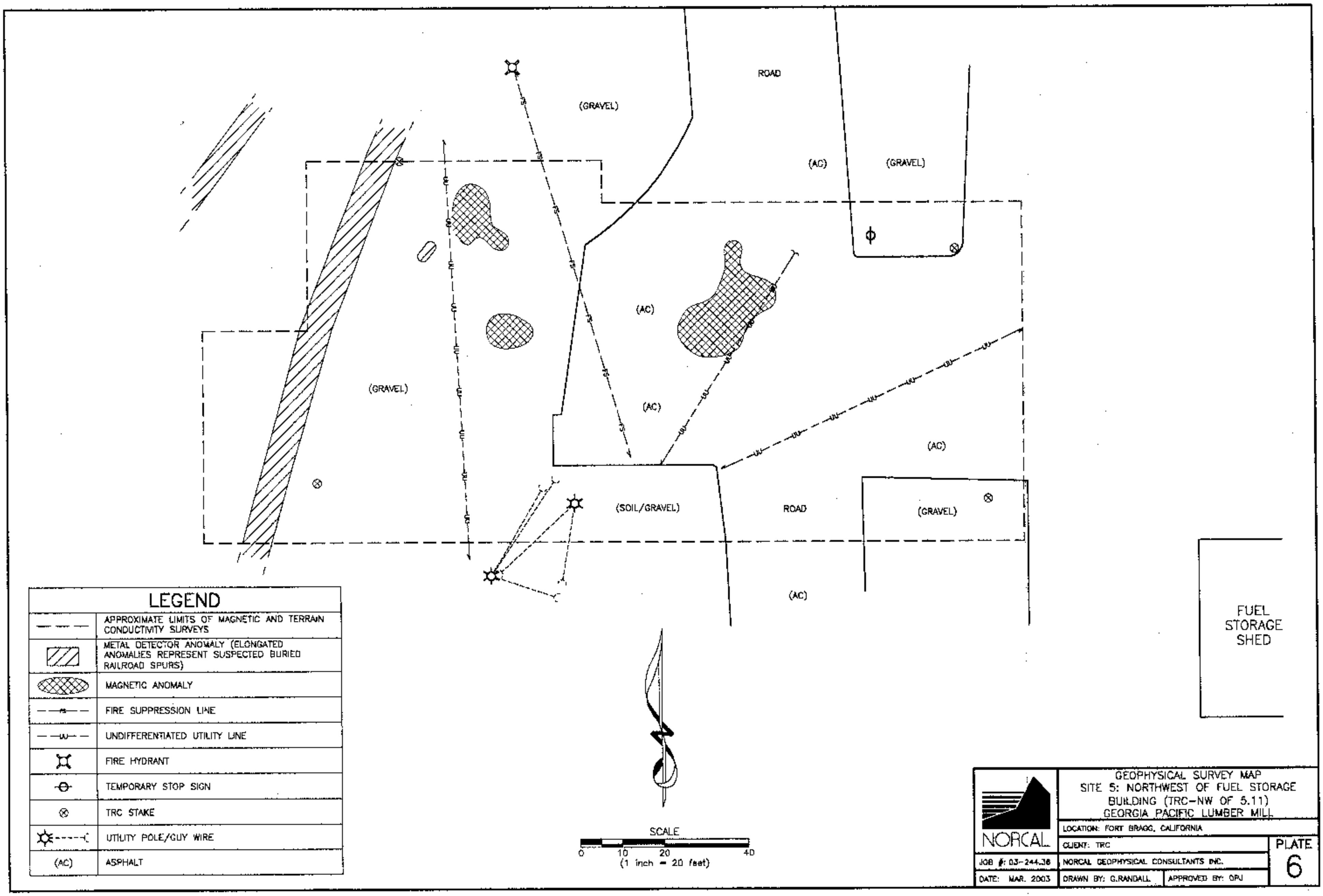


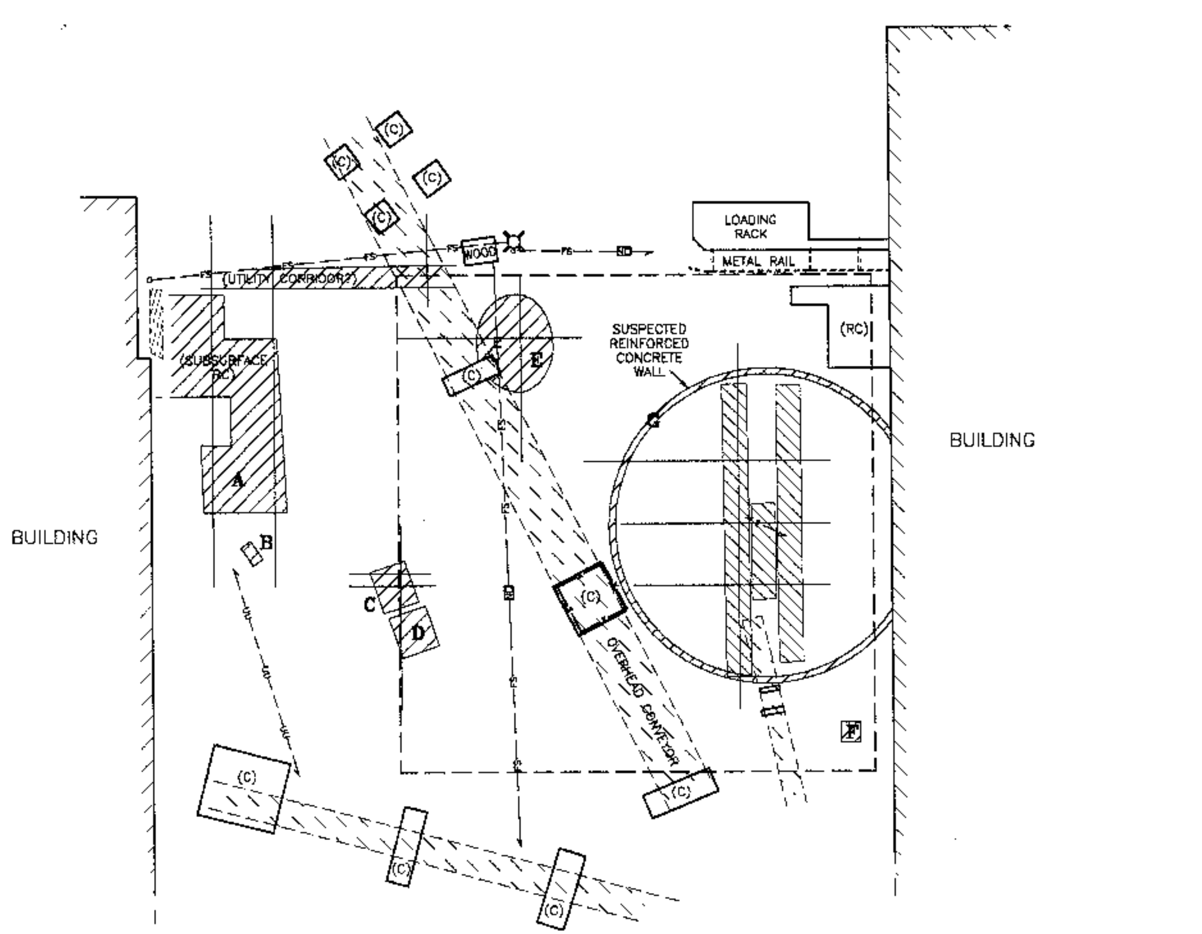

## LEGEND

| | |
|---|---|
| — — — | APPROXIMATE LIMITS OF MAGNETIC AND TERRAIN CONDUCTIVITY SURVEYS |
| | METAL DETECTOR ANOMALY |
| | TERRAIN CONDUCTIVITY ANOMALY |
| — — — | OVERHEAD UTILITY LINE |
| —·—w—·— | UNDIFFERENTIATED UTILITY LINE |
| ⊗ | TRC STAKE |
| ☼ | UTILITY POLE |
| (AC) | ASPHALT |

| | | |
|---|---|---|
| NORCAL | GEOPHYSICAL SURVEY MAP<br>SITE 4: SCRAP METAL AREA (TRC-9.2)<br>GEORGIA PACIFIC LUMBER MILL | |
| | LOCATION: FORT BRAGG, CALIFORNIA | |
| | CLIENT: TRC | PLATE |
| JOB #: 03-244.36 | NORCAL GEOPHYSICAL CONSULTANTS INC. | 5 |
| DATE: MAR. 2003 | DRAWN BY: G.RANDALL  APPROVED BY: DFJ | |



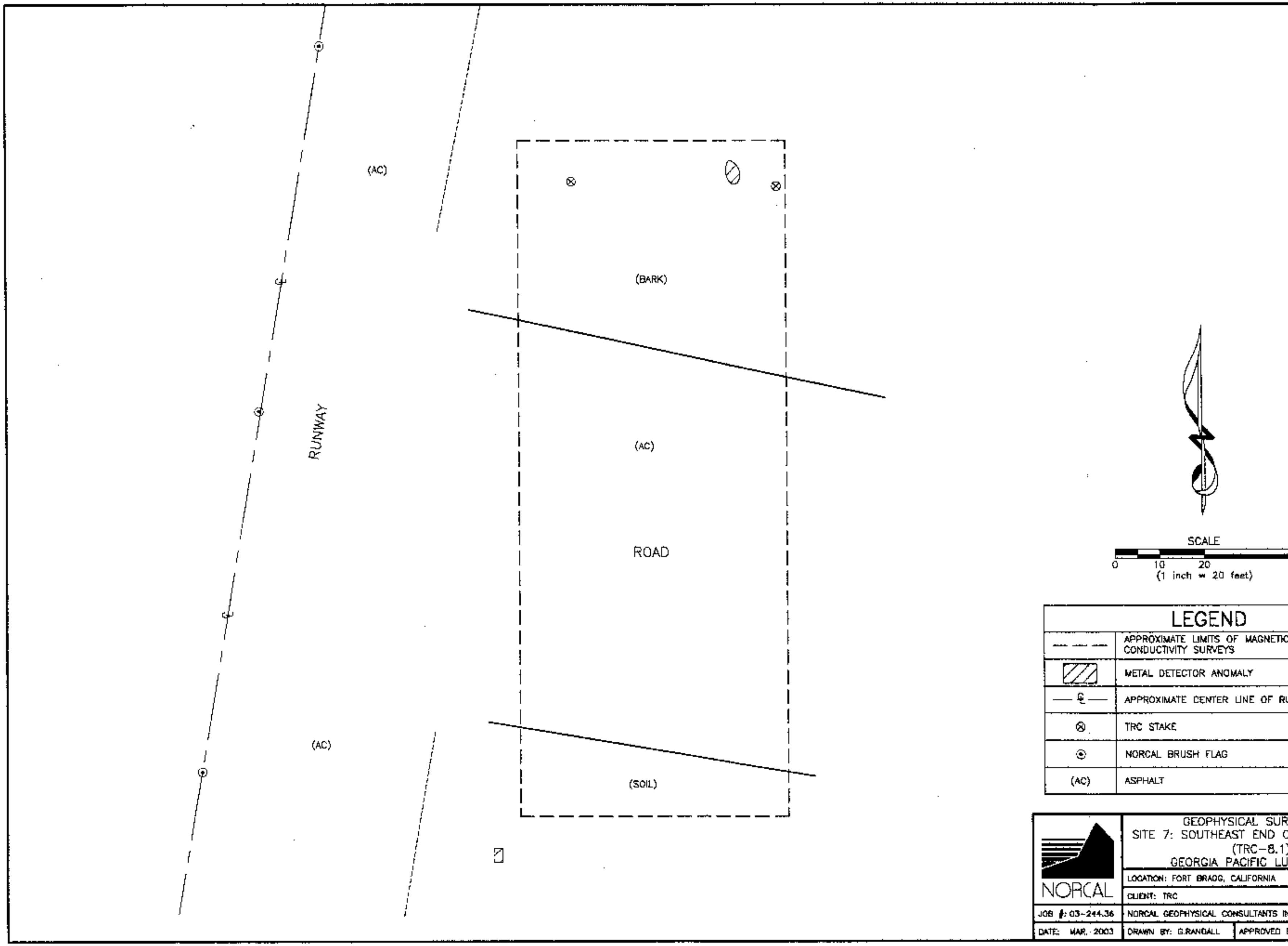
ROAD
(GRAVEL)
(AC)
(GRAVEL)
(AC)
(GRAVEL)
(AC)
(AC)
(SOIL/GRAVEL)
ROAD
(GRAVEL)
(AC)
FUEL STORAGE SHED
LEGEND
APPROXIMATE LIMITS OF MAGNETIC AND TERRAIN CONDUCTIVITY SURVEYS
METAL DETECTOR ANOMALY (ELONGATED ANOMALIES REPRESENT SUSPECTED BURIED RAILROAD SPURS)
MAGNETIC ANOMALY
FIRE SUPPRESSION LINE
UNDIFFERENTIATED UTILITY LINE
FIRE HYDRANT
TEMPORARY STOP SIGN
TRC STAKE
UTILITY POLE/GUY WIRE
(AC) ASPHALT
SCALE
0 10 20 40
(1 inch = 20 feet)
NORCAL
GEOPHYSICAL SURVEY MAP
SITE 5: NORTHWEST OF FUEL STORAGE BUILDING (TRC-NW OF 5.11)
GEORGIA PACIFIC LUMBER MILL
LOCATION: FORT BRAGG, CALIFORNIA
CLIENT: TRC
JOB #: 03-244.36
NORCAL GEOPHYSICAL CONSULTANTS INC.
DATE: MAR. 2003
DRAWN BY: G.RANDALL
APPROVED BY: DPJ
PLATE
6




## LEGEND

| | |
|---|---|
| — — — | APPROXIMATE LIMITS OF TERRAIN CONDUCTIVITY SURVEY |
| ——— | GPR TRAVERSE |
| A | METAL DETECTOR ANOMALY |
| | METAL DETECTOR AND GPR ANOMALY |
| — —FS— — | FIRE SUPPRESSION LINE |
| —FS—⊠— | FIRE SUPPRESSION LINE LOCATED BY VISUAL ALIGNMENT OF VALVES/PIPES (NOT DETECTED) |
| — —UU— — | UNDIFFERENTIATED UTILITY LINE |
| —?— | SUSPECTED UTILITY LINE |
| —x— | FENCE |
| | OVERHEAD CONVEYOR |
| | SURFACE METAL |
| | FIRE HYDRANT |
| (C) | CONCRETE |
| (RC) | REINFORCED CONCRETE |

| | | |
|---|---|---|
| NORCAL | GEOPHYSICAL SURVEY MAP<br>SITE 6: SAWMILL NO. 2 (TRC-7.1)<br>GEORGIA PACIFIC LUMBER MILL | |
| | LOCATION: FORT BRAGG, CALIFORNIA | |
| | CLIENT: TRC | PLATE 7 |
| JOB #: 03-244.36 | NORCAL GEOPHYSICAL CONSULTANTS INC. | |
| DATE: MAR. 2003 | DRAWN BY: G.RANDALL — APPROVED BY: DPJ | |



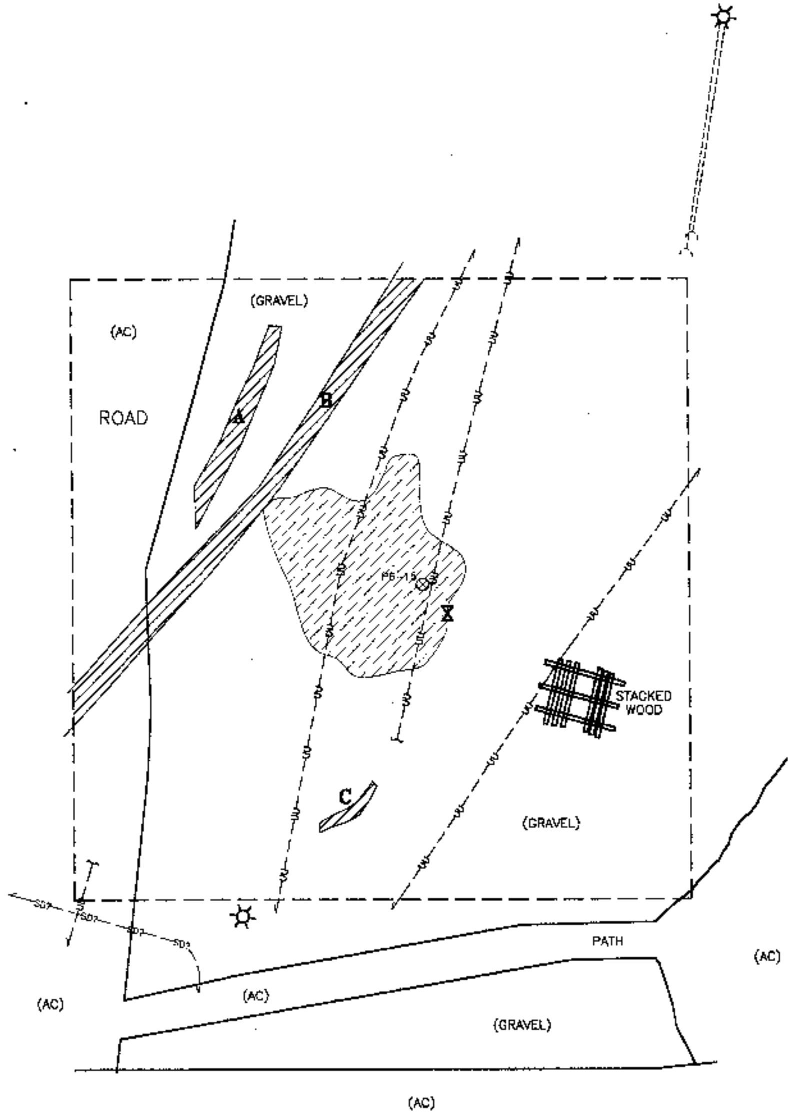

| LEGEND | |
|---|---|
| — — — | APPROXIMATE LIMITS OF MAGNETIC AND TERRAIN CONDUCTIVITY SURVEYS |
| ▨ | METAL DETECTOR ANOMALY |
| — ℄ — | APPROXIMATE CENTER LINE OF RUNWAY |
| ⊗ | TRC STAKE |
| ⊙ | NORCAL BRUSH FLAG |
| (AC) | ASPHALT |

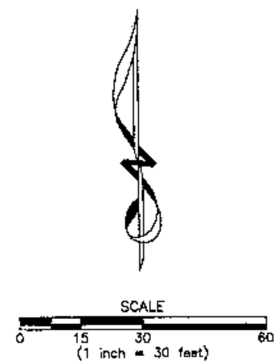
GEOPHYSICAL SURVEY MAP
SITE 7: SOUTHEAST END OF LANDING STRIP
(TRC-8.1)
GEORGIA PACIFIC LUMBER MILL

NORCAL

LOCATION: FORT BRAGG, CALIFORNIA
CLIENT: TRC
JOB #: 03-244.36 | NORCAL GEOPHYSICAL CONSULTANTS INC.
DATE: MAR. 2003 | DRAWN BY: G.RANDALL | APPROVED BY: DPJ

PLATE 8



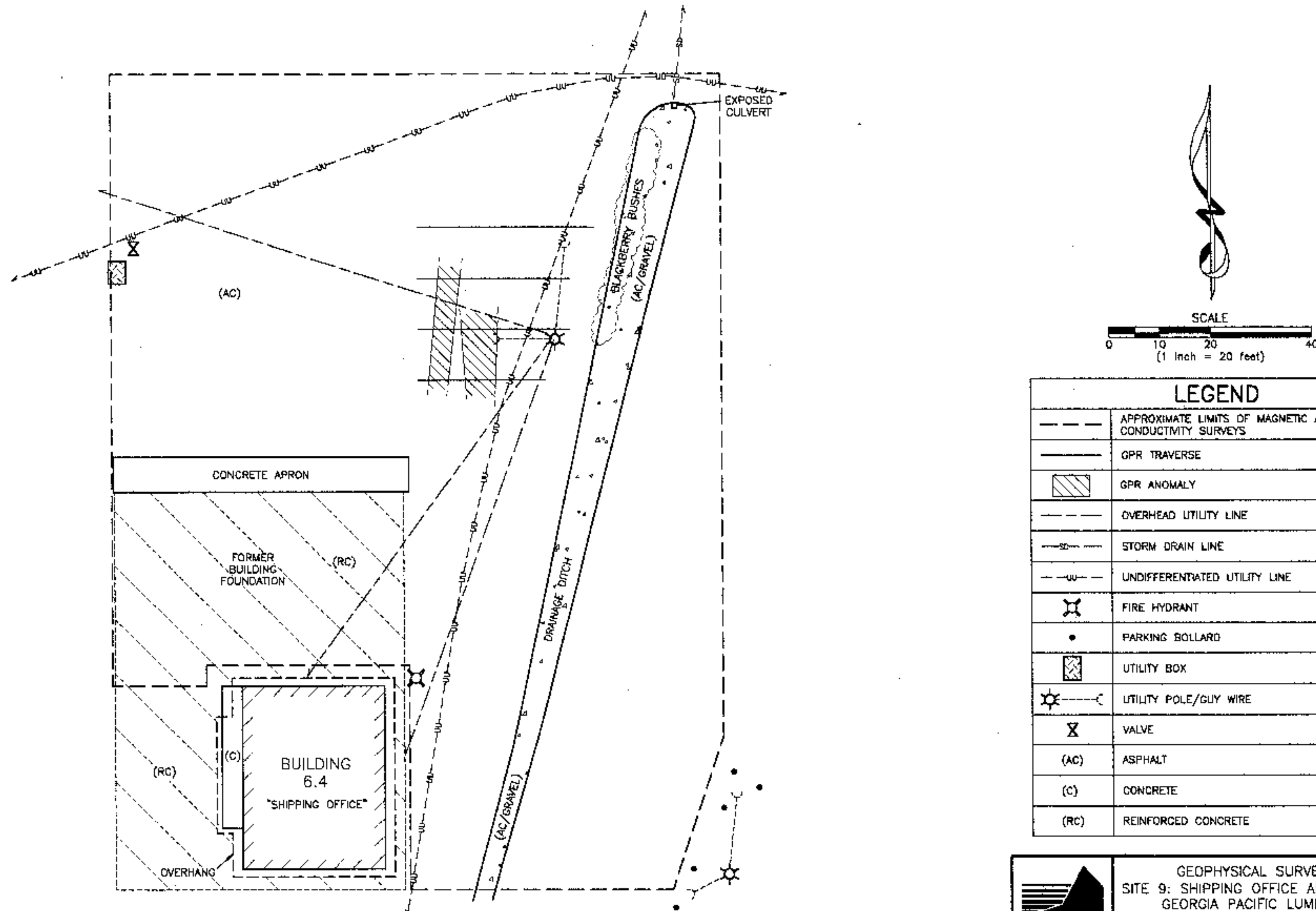

## LEGEND

| | |
|---|---|
| — — — | APPROXIMATE LIMITS OF MAGNETIC AND TERRAIN CONDUCTIVITY SURVEYS |
| A | METAL DETECTOR ANOMALY (ELONGATED ANOMALIES REPRESENT SUSPECTED BURIED RAILROAD SPURS) |
| | TERRAIN CONDUCTIVITY ANOMALY |
| —SD— | SUSPECTED STORM DRAIN LINE |
| —UU— | UNDIFFERENTIATED UTILITY LINES |
| ⊗ | TRC STAKE |
| ⧗ | VALVE |
| ☼----( | UTILITY POLE/GUY WIRE |
| (AC) | ASPHALT |

NORCAL

GEOPHYSICAL SURVEY MAP
SITE 8: AREA EAST OF SHIPPING OFFICE
(TRC–E OF 6.4)
GEORGIA PACIFIC LUMBER MILL

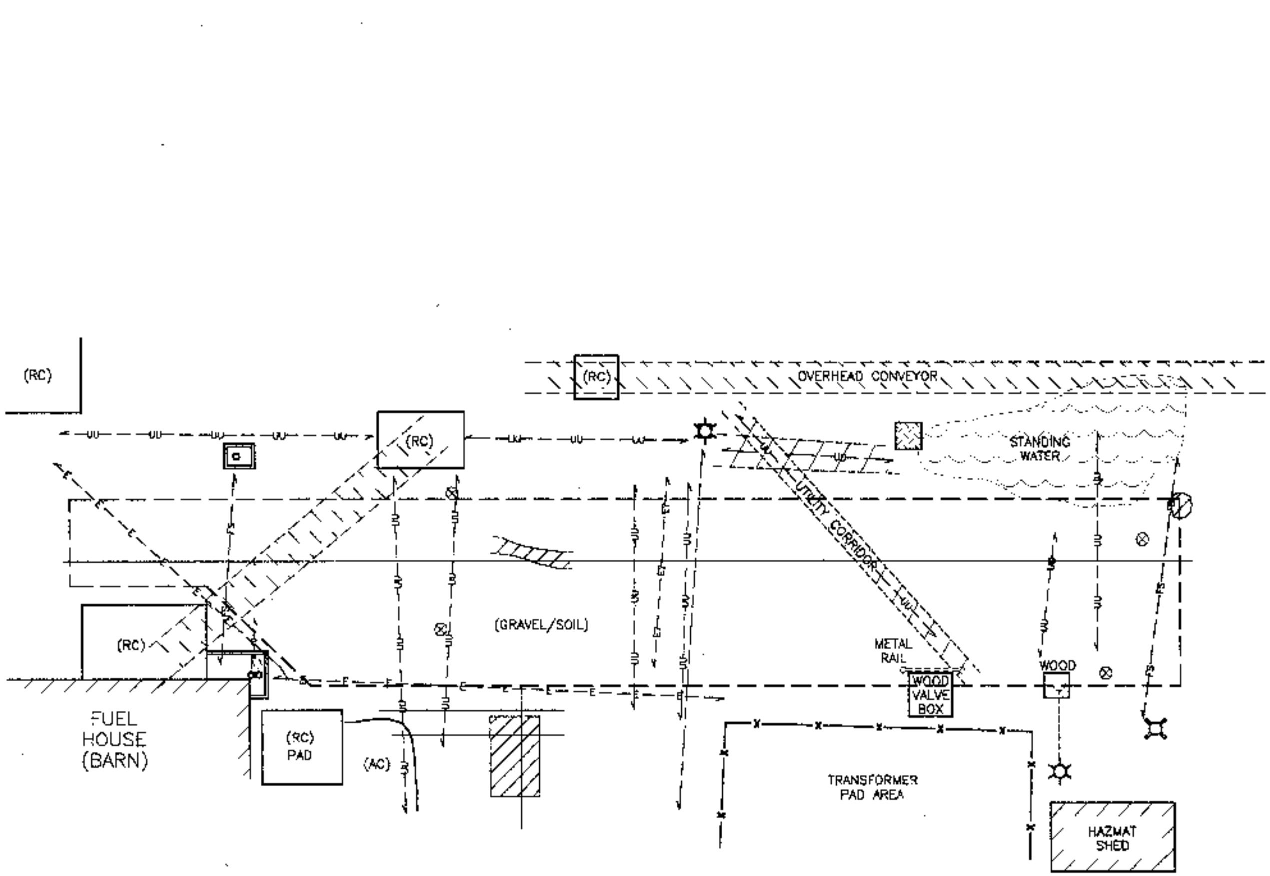
| | | |
|---|---|---|
| LOCATION: FORT BRAGG, CALIFORNIA | | PLATE |
| CLIENT: TRC | | 9 |
| JOB #: 03-244.36 | NORCAL GEOPHYSICAL CONSULTANTS INC. | |
| DATE: MAR. 2003 | DRAWN BY: G.RANDALL | APPROVED BY: DFJ |




## LEGEND

| | |
|---|---|
| — — — | APPROXIMATE LIMITS OF MAGNETIC AND TERRAIN CONDUCTIVITY SURVEYS |
| ——— | GPR TRAVERSE |
| | GPR ANOMALY |
| — — — | OVERHEAD UTILITY LINE |
| —SD— | STORM DRAIN LINE |
| — —UU— — | UNDIFFERENTIATED UTILITY LINE |
| | FIRE HYDRANT |
| • | PARKING BOLLARD |
| | UTILITY BOX |
| | UTILITY POLE/GUY WIRE |
| | VALVE |
| (AC) | ASPHALT |
| (C) | CONCRETE |
| (RC) | REINFORCED CONCRETE |

| | | |
|---|---|---|
| NORCAL | GEOPHYSICAL SURVEY MAP<br>SITE 9: SHIPPING OFFICE AREA (TRC-6.4)<br>GEORGIA PACIFIC LUMBER MILL | |
| | LOCATION: FORT BRAGG, CALIFORNIA | |
| | CLIENT: TRC | PLATE |
| JOB #: 03-244.36 | NORCAL GEOPHYSICAL CONSULTANTS INC. | 10 |
| DATE: MAR. 2003 | DRAWN BY: G.RANDALL / APPROVED BY: DPJ | |




## LEGEND

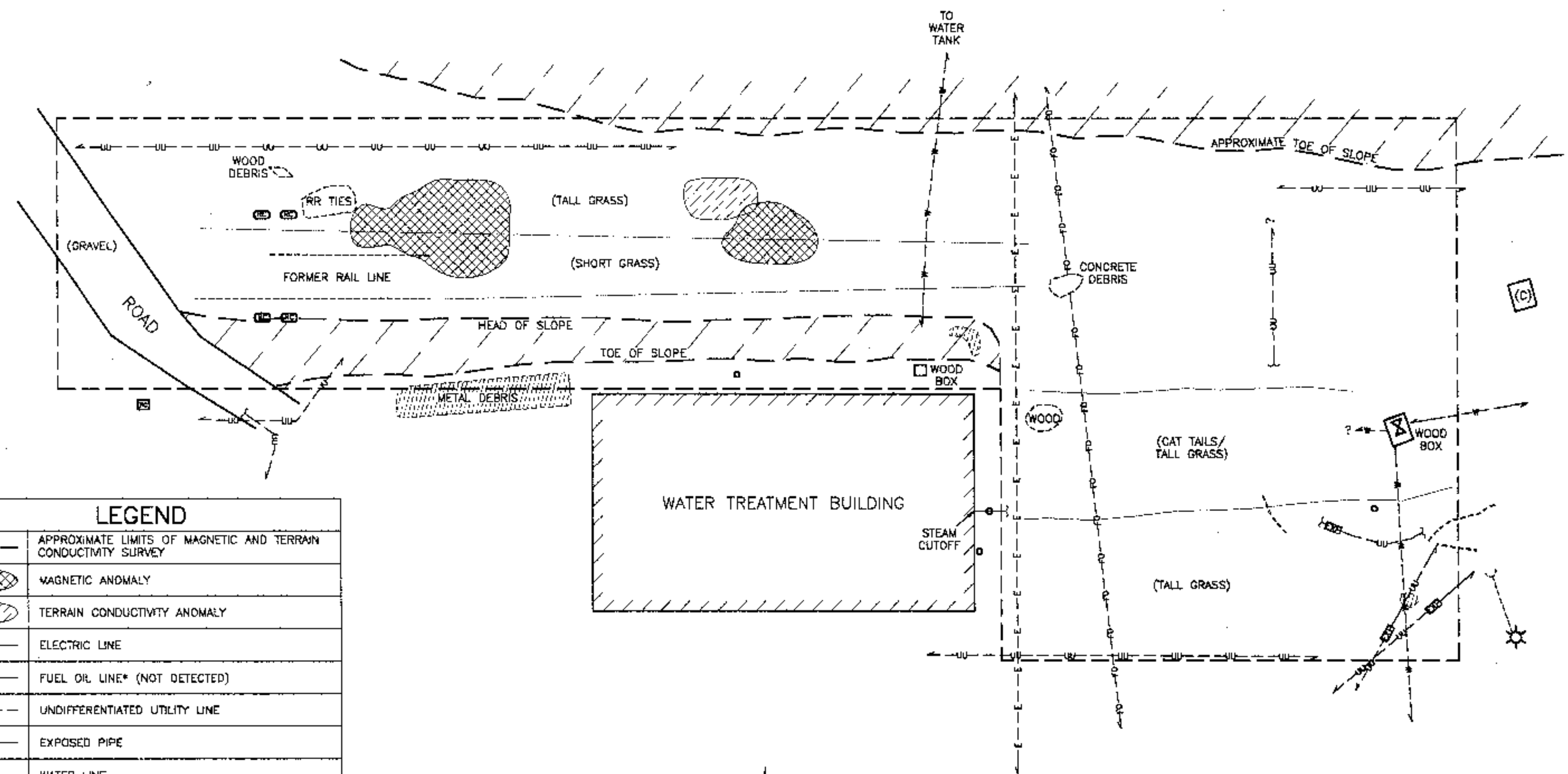
| | |
|---|---|
| | APPROXIMATE LIMITS OF MAGNETIC AND TERRAIN CONDUCTIVITY SURVEYS |
| | GPR TRAVERSE |
| | METAL DETECTOR ANOMALY |
| —E— | ELECTRIC LINE |
| —E?— | SUSPECTED ELECTRIC LINE |
| —FS— | FIRE SUPPRESSION LINE |
| | OVERHEAD UTILITY LINE |
| —FO— | "NEW FUEL OIL" LINE (NOT DETECTED – NON-METALLIC) |
| —UU— | UNDIFFERENTIATED UTILITY LINE |
| | UTILITY CORRIDOR |
| | UTILITY LINE TO WATER TREATMENT BUILDING (NOT DETECTED) |
| | FIRE HYDRANT |
| ⊗ | TRC STAKE |
| | OVERHEAD CONVEYOR |
| | UTILITY BOX |
| | UTILITY POLE/GUY WIRE |
| —x— | FENCE |
| (AC) | ASPHALT |
| (RC) | REINFORCED CONCRETE |

NORCAL

GEOPHYSICAL SURVEY MAP
SITE 10: NORTHEAST OF FUEL BARN
(TRC-N OF 4.7, 4.9, 4.10)
GEORGIA PACIFIC LUMBER MILL

LOCATION: FORT BRAGG, CALIFORNIA
CLIENT: TRC
JOB #: 03-244.36 | NORCAL GEOPHYSICAL CONSULTANTS INC.
DATE: MAR. 2003 | DRAWN BY: G.RANDALL | APPROVED BY: DPJ

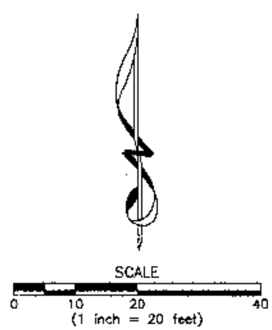
PLATE 11




## LEGEND

| | |
|---|---|
| — — — | APPROXIMATE LIMITS OF MAGNETIC AND TERRAIN CONDUCTIVITY SURVEY |
| | MAGNETIC ANOMALY |
| | TERRAIN CONDUCTIVITY ANOMALY |
| —E— | ELECTRIC LINE |
| —FO— | FUEL OIL LINE* (NOT DETECTED) |
| —UU— | UNDIFFERENTIATED UTILITY LINE |
| —EXP— | EXPOSED PIPE |
| ---*--- | WATER LINE |
| o | PIPE |
| | SURFACE METAL/REBAR |
| | UTILITY POLE/GUY WIRE |
| ⋈ | VALVE |
| (C) | CONCRETE |
| (RC) | REINFORCED CONCRETE |

*FUEL OIL LINE NOT DETECTED; APPROXIMATE LOCATION SHOWN FROM VISUAL ALIGNMENT OF PIPE ENTERING GROUND AT NORTHEAST CORNER OF FUEL BARN (4.7) AND SOUTHWEST CORNER OF POWER HOUSE FUEL STORAGE SHED (4.1)




NORCAL

GEOPHYSICAL SURVEY MAP
SITE 11: FORMER BUNKER FUEL AST AREA
(TRC-4.2)
GEORGIA PACIFIC LUMBER MILL

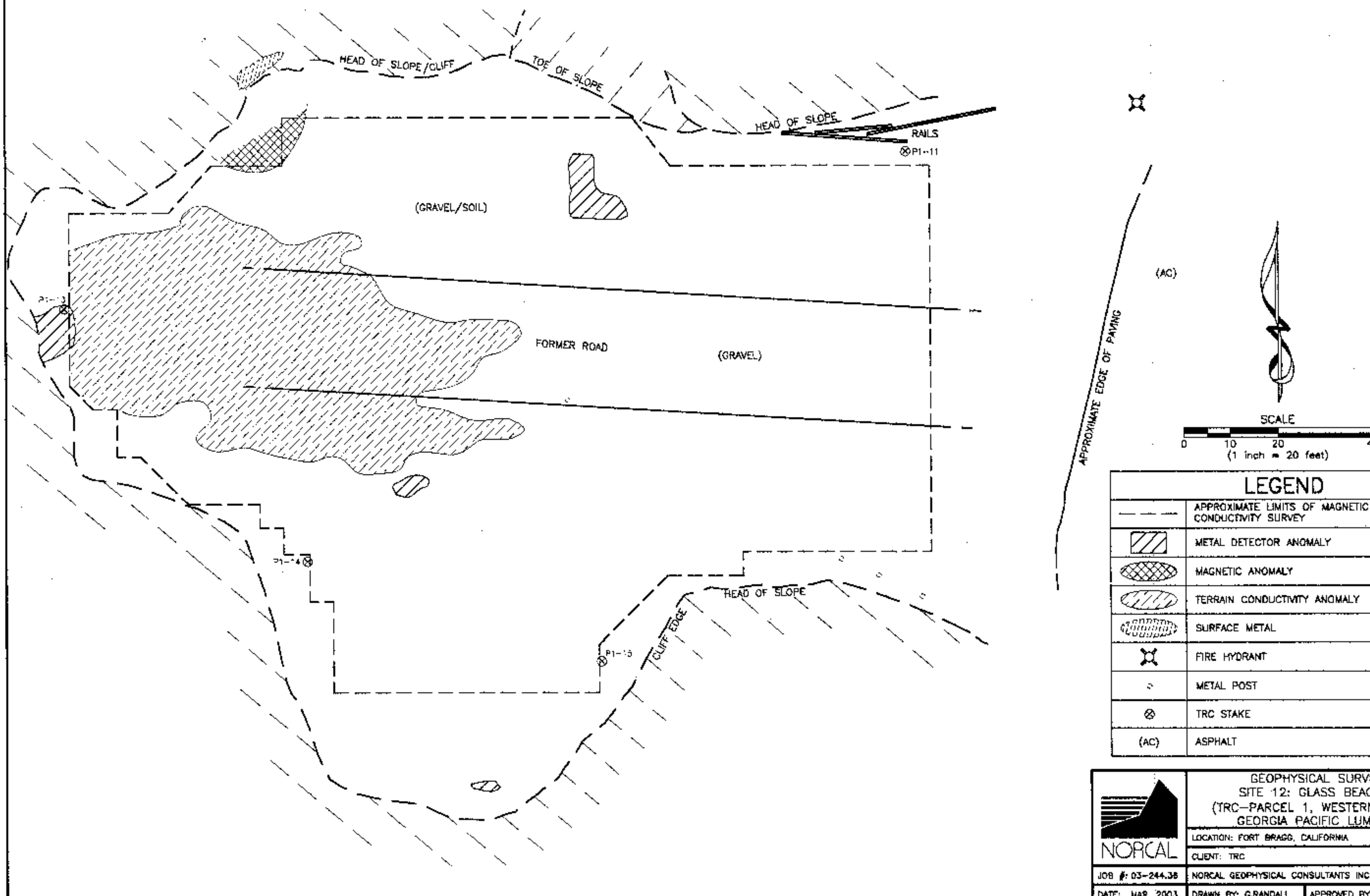
LOCATION: FORT BRAGG, CALIFORNIA

CLIENT: TRC

JOB #: 03-244.38 | NORCAL GEOPHYSICAL CONSULTANTS INC.

DATE: MAR. 2003 | DRAWN BY: G.RANDALL | APPROVED BY: DPJ

PLATE 12




## LEGEND

| | |
| --- | --- |
| — — — | APPROXIMATE LIMITS OF MAGNETIC AND TERRAIN CONDUCTIVITY SURVEY |
| | METAL DETECTOR ANOMALY |
| | MAGNETIC ANOMALY |
| | TERRAIN CONDUCTIVITY ANOMALY |
| | SURFACE METAL |
| ⌘ | FIRE HYDRANT |
| ◦ | METAL POST |
| ⊗ | TRC STAKE |
| (AC) | ASPHALT |

GEOPHYSICAL SURVEY MAP
SITE 12: GLASS BEACH NO. 3
(TRC–PARCEL 1, WESTERNMOST POINT)
GEORGIA PACIFIC LUMBER MILL

NORCAL

LOCATION: FORT BRAGG, CALIFORNIA

CLIENT: TRC

NORCAL GEOPHYSICAL CONSULTANTS INC.

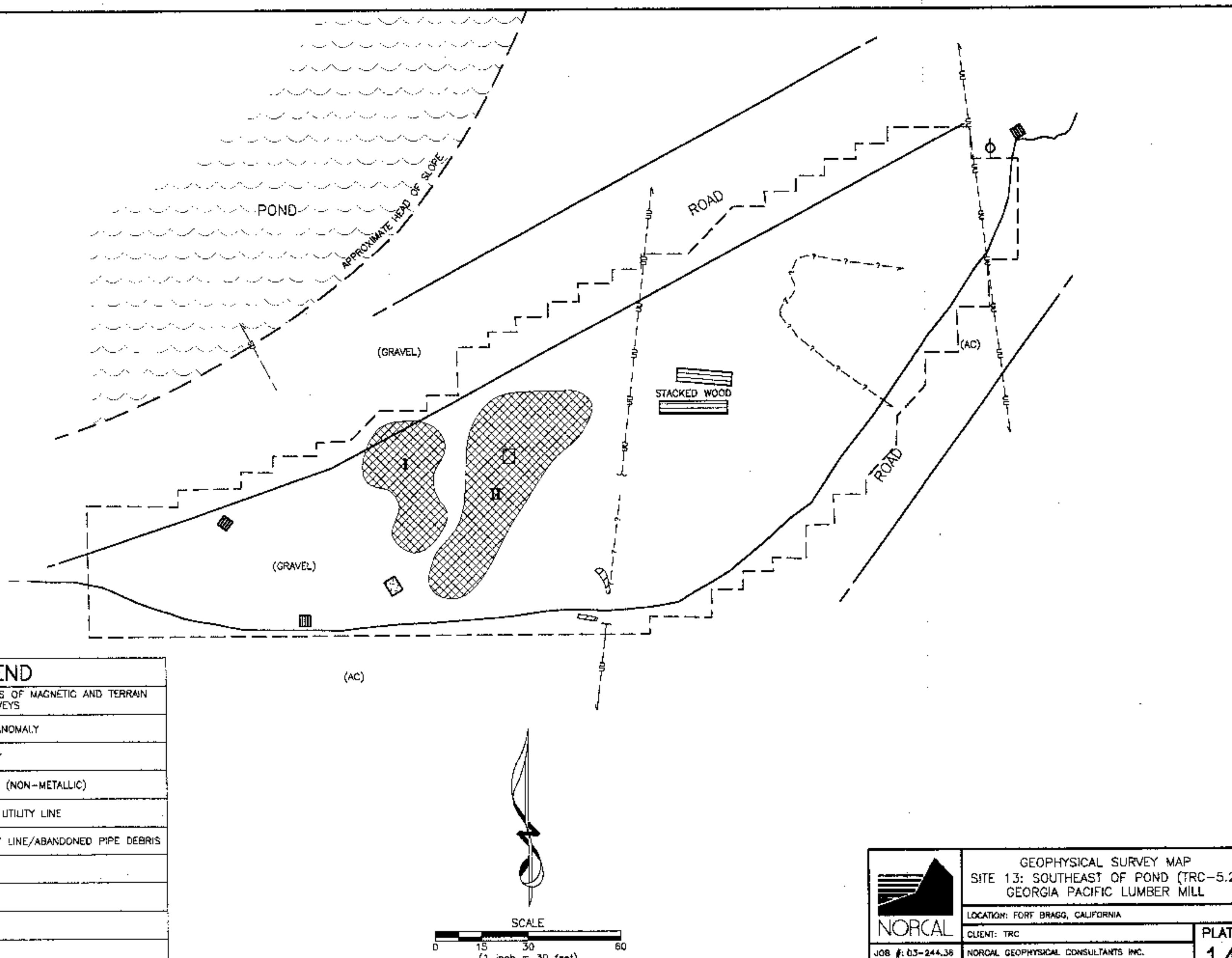
JOB #: 03-244.38

DATE: MAR. 2003

DRAWN BY: G.RANDALL

APPROVED BY: DPJ

PLATE 13




## LEGEND

| | |
|---|---|
| — — — | APPROXIMATE LIMITS OF MAGNETIC AND TERRAIN CONDUCTIVITY SURVEYS |
| | METAL DETECTOR ANOMALY |
| I | MAGNETIC ANOMALY |
| —SD— — | STORM DRAIN LINE (NON-METALLIC) |
| — —UU— — | UNDIFFERENTIATED UTILITY LINE |
| —?— — | SUSPECTED UTILITY LINE/ABANDONED PIPE DEBRIS |
| | CATCH BASIN |
| | METAL PLATE |
| Φ | STOP SIGN |
| (AC) | ASPHALT |

GEOPHYSICAL SURVEY MAP
SITE 13: SOUTHEAST OF POND (TRC-5.2)
GEORGIA PACIFIC LUMBER MILL

NORCAL

LOCATION: FORT BRAGG, CALIFORNIA
CLIENT: TRC
NORCAL GEOPHYSICAL CONSULTANTS INC.
JOB #: 03-244.38
DATE: MAR. 2003
DRAWN BY: G.RANDALL
APPROVED BY: DPJ
PLATE 14

# Appendix A

# Geophysical Methods

## Metal Detection (MD)

### Methodology

This method uses the principle of electromagnetic induction to detect shallowly buried metal objects such as USTs, metal utility conduits, rebar in concrete, manhole covers, and various metallic debris. This is done by carrying a hand-held radio transmitter-receiver unit above the ground and continuously scanning the surface. A primary coil broadcasts a radio signal from a transmitter. This primary radio signal induces secondary electrical currents in metal objects. These secondary currents in turn a produce magnetic field which is detected by the receiver.

### Instrumentation

The MD instrument that we typically use for shallow subsurface investigations is a Fisher TW-6 pipe and cable locator. This instrument is expressly designed to detect metallic pipes, cables, USTs, manhole covers, and other large, shallowly buried metallic objects. The instrument operates by generating both a meter reading (unitless) and an audible response when near a metal object. The peak instrument response usually occurs when the unit is directly over the object.

### Data Analysis

The TW-6 does not provide a recordable data output that can be used for later computer processing. Results are generally limited to marking the interpreted outlines of detected objects in the field and mapping their locations.

### Limitations

In general, the response of the MD instrument is roughly proportional to the horizontal surface area of near surface buried objects (typically in the upper three or four feet). This relationship can be used to advantage in discriminating between metal debris, reinforced concrete pads, and pipelines. However, in the presence of above ground metal objects such as fences, walls, parked cars, and metal debris, this is no longer valid. In some instances, the presence of such objects can make it very difficult to determine whether the instrument responses are associated with below ground targets or above ground cultural features. When multiple sources are present it may not be possible to identify individual targets. Also, relatively large objects that have a limited horizontal cross-section such as well casing and fence posts are sometimes difficult to detect.

# Electromagnetic Line Locating (EMLL)

## Methodology

The EMLL method is used to detect the electromagnetic field resulting from an electric current flowing on a line. These fields can arise from currents already on the line (passive, or ambient) or currents applied to a line with a transmitter (active). The most common passive signals are generated by live electric lines and re-radiated radio signals. Active signals can be introduced by connecting the transmitter to the line at accessible locations or by induction.

## Instrumentation

The EMLL instruments that we typically use to locate and confirm positions of underground utilities: include a RadioDetection RD-400 and a Fisher TW-6 "M-Scope." These instruments operate by generating both a meter reading (unitless) and an audible response when carried over a utility or metal pipe. The peak instrument response usually occurs when the unit is directly over the object.

## Data Analysis

Neither EMLL instrument provides recordable data output that can be used for later computer processing. Results are generally limited to marking the interpreted position of detected utilities at several points along the facility and mapping the subsequent alignment.

## Limitations

The detection of underground utilities is determined by the composition and construction of the line in question. Utilities detectable with standard line location techniques include any continuously connected metal pipes, cables/wires or utilities with tracer wires. Unless carrying passive currents, these utilities must be exposed at the surface or in accessible utility vaults. These generally include water, electric, natural gas, telephone, and other conduits related to facility operations. Utilities that are not detectable using standard electromagnetic line location techniques include those made of non-electrically conductive materials such as PVC, fiberglass, vitrified clay, and pipes with insulated connections.

## Ground Penetrating Radar (GPR)

Methodology

Ground penetrating radar is a method that provides a continuous, high resolution graphical cross-section of the shallow subsurface. The method entails repeatedly radiating an electromagnetic pulse into the ground from an antenna as it is moved along a traverse. Reflected signals are received by an antenna (often the same one used to generate the signal) and sent to a control unit for processing. The control unit then converts the varying amplitude of reflected radar signals as a function of time into a cross-sectional image showing signal amplitude as a function of depth.

GPR is particularly sensitive to variations of two electrical properties. One property is conductivity (the ability of a material to conduct a charge when a field is applied) and the other is permittivity (the ability of a material to hold a charge when a field is applied). These two properties determine how far a signal can propagate. They also determine the strength of reflected signals that can be generated at material boundaries. Most soil and earthen-like materials such as concrete are electrically resistive and have a relatively low permittivity. As a result, they are relatively transparent to electromagnetic energy. This means that only a portion of the radar signal incident upon them is reflected back to the surface. On the other hand, when the signal encounters an object composed of a material that has the opposite electrical properties, especially one with a high permittivity (such as metal) much of the incident energy is reflected.

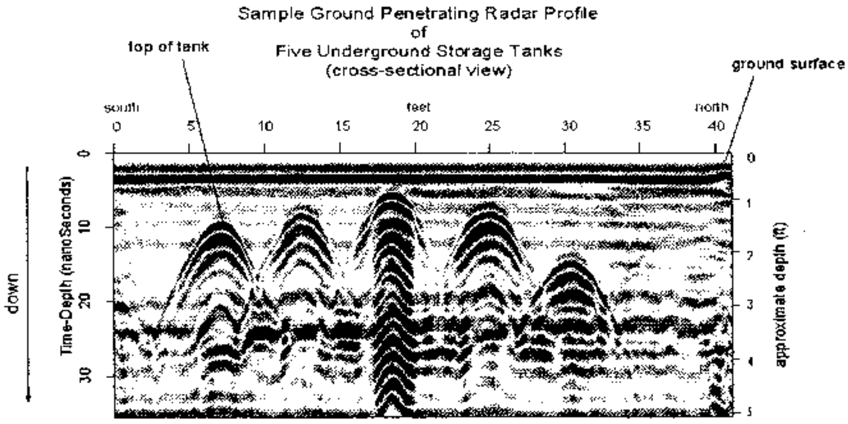
Instrumentation

We typically perform GPR surveys using a Geophysical Survey Systems, Inc. SIR-2000 Subsurface Interface Radar System equipped with a 500 megahertz (MHz) transducer. This unit is comprised of a combined control/data recording console that is connected by a telemetry cable to the antenna. This system is often chosen for investigating environmental sites since it usually provides both the resolution and depth penetration needed for characterizing the upper three to four feet of the subsurface.

Data Analysis

The interpretation of GPR data involves examining the graphical records for reflections from buried objects. GPR records display changes in reflected signal strength and arrival time with changes in horizontal position. Strong signals appear dark and weak reflections appear light. Reflections that arrive earlier in time are placed in the upper portions of the record and reflections that arrive later are placed lower, towards the bottom of the records. Horizontal position is across the top of the record.

In areas with relatively uniform conditions, with no buried objects producing reflections, the records typically appear as a series of alternating dark and light horizontal bands. In areas where there are subsurface objects producing reflections, the horizontal banding is disrupted. Discrete objects typically produce reflections having the appearance of inverted "U"s, forming what are known as "hyperbolic reflections". Metallic objects often produce markedly strong reflections, in many cases forming multiple reflections appearing as a series of inverted U's cascading down the record. Non-metallic objects can produce similar reflections, but the multiples are typically much weaker. A sample profile from a site with five adjacent steel USTs is presented below:




*Note: the "Time Depth" of 35 nanoSeconds at the bottom of this profile corresponds to a true depth of approximately 5 feet for this example only. Actual depth to bottom of other profiles may be different.*

An object's burial depth may also be estimated from GPR profiles. As mentioned above, GPR measures signal amplitude as a function of time. However, the translation of the radar signal's travel time (technically known as time-depth) to an actual distance (true depth) is not always a simple one. Strictly speaking, in order to translate from time-depth to true depth the signal velocity within each time interval must be known. Since this is not routinely determined in the field, estimated velocities are often used for determining the approximate depth to a reflector. The empirical values for GPR signal propagation velocities within commonly encountered soils are obtained from published tables.

Limitations

The ability to detect subsurface targets is dependent on specific site conditions. These conditions include depth of burial, the size or diameter of the target, the condition of the specific target in question, the type of backfill material associated with the target, and the surface conditions over the target. Typically, the depth of detection will be reduced as the clay and/or moisture content in the subsurface increases. As a result, depths of detection (using a 500 Mhz antenna) typically range from as deep as six feet to as little as a few inches

## Magnetic Method (MAG)

Methodology

The MAG method commonly used to detect ferrous objects. By measuring the lateral variations of the earth's magnetic field the locations of ferrous objects can be determined. The magnetic field at any given point on the earth's surface is the vector sum of the earth's field combined with the magnetic fields of nearby metal objects. Many magnetometers measure the total intensity of the magnetic field. These are referred to as total field measurements (TF) and are recorded in units of nanoTesla (nT). In environmental investigations it is also sometimes useful to measure not just the total field intensity, but the vertical gradient of the magnetic field as well. The vertical magnetic gradient is the vertical rate of change of the total field magnetic intensity. These are recorded in units of nanoTesla/meter (nT/m). While both TF and VMG measurements are related to the same phenomena (i.e. the magnetic field), each has certain advantages over the other. VMG measurements are generally less affected by nearby *above* ground objects, especially objects to the side of the instrument. Over the short time frame needed to acquire data at small sites neither the total field or vertical gradient measurements are significantly affected by temporal (diurnal) variations in the earth's magnetic field. Magnetic gradient effects attenuate more rapidly than total field measurements with increasing distance from magnetic sources, thus allowing more precise determination of a buried object's location. However, because the gradient method is very sensitive, small near surface objects can be a source of noise in gradient data when looking for larger potentially deeper targets.

Instrumentation

The instrument typically used for shallow subsurface investigations is a Scintrex ENVIMAG proton procession magnetometer with one sensor to collect the total field magnetic intensity data or two sensors to collect vertical magnetic gradient data. The sensors are attached to a vertical staff approximately 6-8 feet above the ground surface. The device is carried by the operator and MAG readings are taken at a specified grid spacing. The instrument features a built-in memory that stores the vertical magnetic gradient data and survey grid information.

Data Analysis

*Computer Processing*

VMG data are typically processed in the field on a portable computer. The uploaded data are converted into a format suitable for contouring using the program SURFER from Golden Software. This program calculates an evenly spaced array of values (data grid) based on the measured field data. These gridded values are then contoured to produce VMG contour maps for interpretation.

*Contour Map Interpretation*

Generally speaking, in a region with fairly uniform magnetic conditions the VMG values will vary smoothly from one area to another. Under these conditions, contour lines are usually spaced far apart. In contrast, in those areas where VMG variations are stronger, the contours are closely spaced. In some cases the variations are so strong that the contours become highly contorted and convoluted. These contorted contours may form roughly concentric circles, tightly wound loops and whorls, or elongated parallel lines. Actual magnitude and shape of the contour lines is dependent on the relative position and size of the magnetic object with respect to the location of the magnetic sensors.

Roughly concentric circles that look like bull's-eyes are generally referred to as monopoles. Monopoles that are roughly limited in extent to the data point spacing of the sampling grid are often caused by relatively small, near surface objects with limited cross-section. These typically consist of well caps, pull boxes, balls of wire, etc. On the other hand, larger monopoles that extend across an area of several data points are typically associated with larger, deeper objects such as well casings, reinforced concrete footers, ends of pipelines, etc. In other cases, two monopoles, one positive and one negative, may be in close proximity and form a paired of high-low closures known as a dipole. Dipoles are often, but not always, attributed to larger objects such as USTs, vaults, buried ordnance, etc. that have a substantial diameter or width.

Irregular patterns of loops and whorls are often indicative of several magnetic objects being present with variable shape, mass, and distribution. These VMG patterns are the most difficult to interpret. Past experience has shown that such patterns are usually associated with debris fields, landfills, and demolition sites.

A series of parallel contours typically indicates that an elongate object such as a building wall, fence, or underground pipeline is the magnetic source.

Regardless of whether the contours form monopoles, dipoles, or irregular whorls, if there are no obvious nearby above ground sources that could cause such magnetic variations, then subsurface objects are suspected. Contours are typically considered anomalous when large differences in data readings (on the order of several hundred to several thousands of nT/m) from one data station to the next are displayed. The anomalous variations are called VMG anomalies.

<u>Limitations</u>

Buried ferrous metal objects produce localized variations in the earth's magnetic field. The magnetic intensity associated with these objects depends on the mass of the metal and the distance the metal object is from the magnetometer sensor. As a general rule, anomaly magnitude typically decreases and anomaly width increases as distance (depth) to the source increases, thereby making detection more difficult. In addition, the ability to detect a buried metal object is based on the intensity of these variations in contrast to the intensity of background variations. The intensity of background variations is based on the amount of above and below ground metal that is present within the survey area. Cultural features such as chain-link fences, buildings, debris, railroad spurs, utilities, above ground electric lines, etc. typically produce magnetic variations with high intensities. These variations may mask the magnetic effects from buried metal objects and thus make it very difficult to determine whether the magnetic variations are associated with below ground metal or above/below ground cultural features.

## Electromagnetic Terrain Conductivity (TC)

### Methodology

The terrain conductivity method uses the principle of electromagnetic induction to measure variations in subsurface electrical conductivity. These changes in conductivity can arise from natural changes in soil composition or from buried foreign objects. The method utilizes two coils separated by a fixed distance. One of these coils transmits a primary signal that induces a current flow (secondary signal) in the earth. The other coil senses this secondary signal. For measurement purposes the secondary signal is broken down into both quadrature and in-phase components (relative to the primary current). The quadrature component is used to determine electrical conductivity and is measured in milliSiemens/meter (mS/m). The in-phase component also changes with conductivity, but varies in a different way than the quadrature component. In-phase measurements are expressed in parts-per-thousand (PPT).

When highly resistive material is encountered, as is the case for most earth material, there is a linear relationship between the quadrature component and conductivity. When highly conductive materials like metals are encountered, both quadrature and in-phase components can be quite large and their behavior is often non-linear. While this non-linear effect can make the measurement of both components useful in looking for buried metal, it is typically the quadrature component that is analyzed. This is because the quadrature component is affected by both metallic and non-metallic materials, whereas the in-phase component is affected primarily only by metals.

### Instrumentation

The instrument typically used for shallow subsurface investigations is a Geonics, Ltd. EM31-DL terrain conductivity meter. This instrument consists of transmitting and receiving coils mounted at opposites ends of a horizontal boom and a control console in between. The separation distance of the coils is approximately 12 feet. This translates into an effective sampling depth of approximately 18 feet. The device is carried by the operator at hip-level and TC readings are taken by pressing a trigger button. The EM31 is connected to an Omnidata data recorder that automatically stores the TC values as well as station locations and any field notes. The data logger stores the data in a way that it can be up-loaded to a computer for processing.

### Computer Processing

TC data are typically processed in the field on a portable computer. The up-loaded data are converted into a format suitable for contouring using the program SURFER from Golden Software. This program calculates an evenly spaced array of values (data grid) based on the measured field data. These gridded values are then contoured to produce TC contour maps for interpretation.

### Contour Map Interpretation

Generally speaking, in a region with fairly uniform conductivity conditions the TC values will vary smoothly from one area to another. Under these conditions, contour lines are usually spaced far apart. In contrast, in those areas where lateral TC variations are stronger, the contours are closely spaced. In some cases the variations are so strong that the contours become highly contorted. These contorted contours may form roughly concentric circles suggestive of bull's-eyes, tightly wound loops and whorls that look like finger prints, or elongated parallel lines. Actual magnitude and shape of the contour lines is dependent on the how rapidly the conductivity of the subsurface changes and if there are any metallic objects that can affect the instrument readings.

Roughly concentric circles are generally referred to as monopoles. Monopoles that are roughly limited in extent to the data point spacing of the sampling grid are often caused by relatively small, near surface metallic objects with limited cross-section. These typically consist of well caps, pull boxes, balls of wire, etc. On the other hand, larger monopoles that extend across an area of several data points are typically associated with larger, deeper objects such USTs, concrete pads, backfilled zones, etc.

Irregular patterns of loops and whorls are often indicative of several conductive objects being present with variable shape, size, conductivity, and distribution. These irregular TC patterns are the most difficult to interpret. Past experience has shown that such patterns are usually associated with debris fields, landfills, and demolition sites.

A series of generally parallel contour lines typically indicates the source is an elongate object such as a building wall, fence, or underground pipeline. If the parallel contours are more or less straight, then this indicates the object was oriented roughly parallel to the direction of the EM31's coil boom during data collection. If the contour lines form a series of parallel, undulating contours (also referred to as a "herring bone" pattern), then this indicates the source was oriented roughly perpendicular to the EM31's boom during data collection.

Regardless of whether the contours form discrete monopoles, irregular patterns, or parallel lines, if there are no obvious nearby above ground sources that could cause such variations, then subsurface objects are suspected. TC contours are typically considered anomalous when differences larger than a few tens of milliSiemens per meter are displayed from one data station to the next.

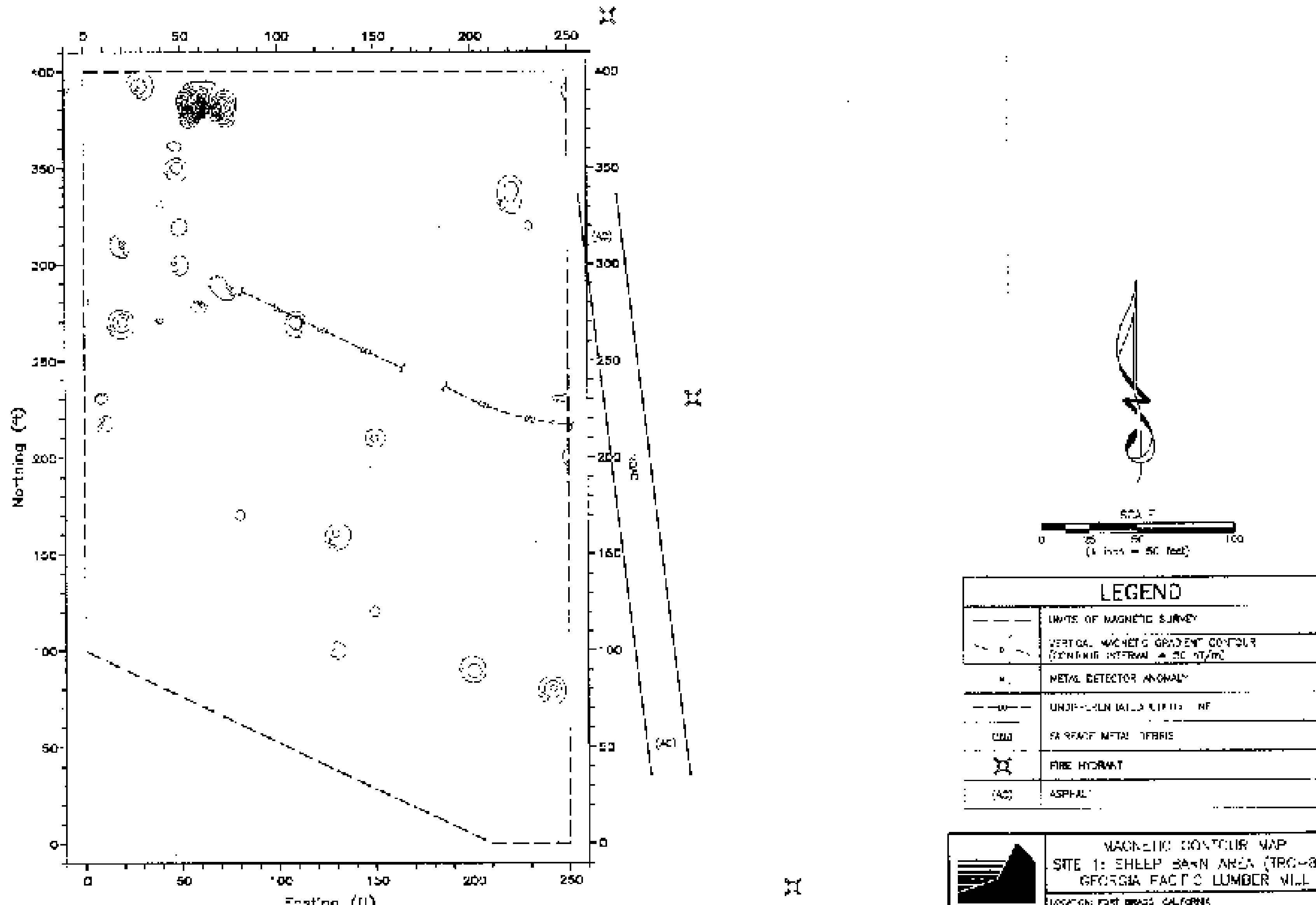
Limitations

Buried ferrous metal objects often produce large localized variations, or anomalies, in terrain conductivity. As a general rule, anomaly magnitude typically decreases, and anomaly width increases, as distance (depth) to the source increases. This can make detection of small, deeply buried metallic objects difficult. In addition, the ability to detect a buried metal object is based on the intensity of these variations in contrast to the intensity of background variations. The intensity of background variations is based on the conductivity of the soil and the amount of above and below ground metal present within a survey area. Cultural features such as chain link fences, buildings, debris, railroad spurs, utilities, above ground electric lines, etc. typically produce variations with high intensities. These variations may mask the TC effects of buried metal objects and thus make it very difficult to determine whether the variations are associated with below ground metal or known above/below ground cultural features.

Apart from the physical limitations of the instrument and the unwanted effects from secondary objects, the ability to detect subsurface features is also dependent upon the density of data acquisition points. If the distance between data acquisition points is significantly larger than the size of the target object, then the object may not be detected.

## Appendix B

## MAG and TC Contour Maps



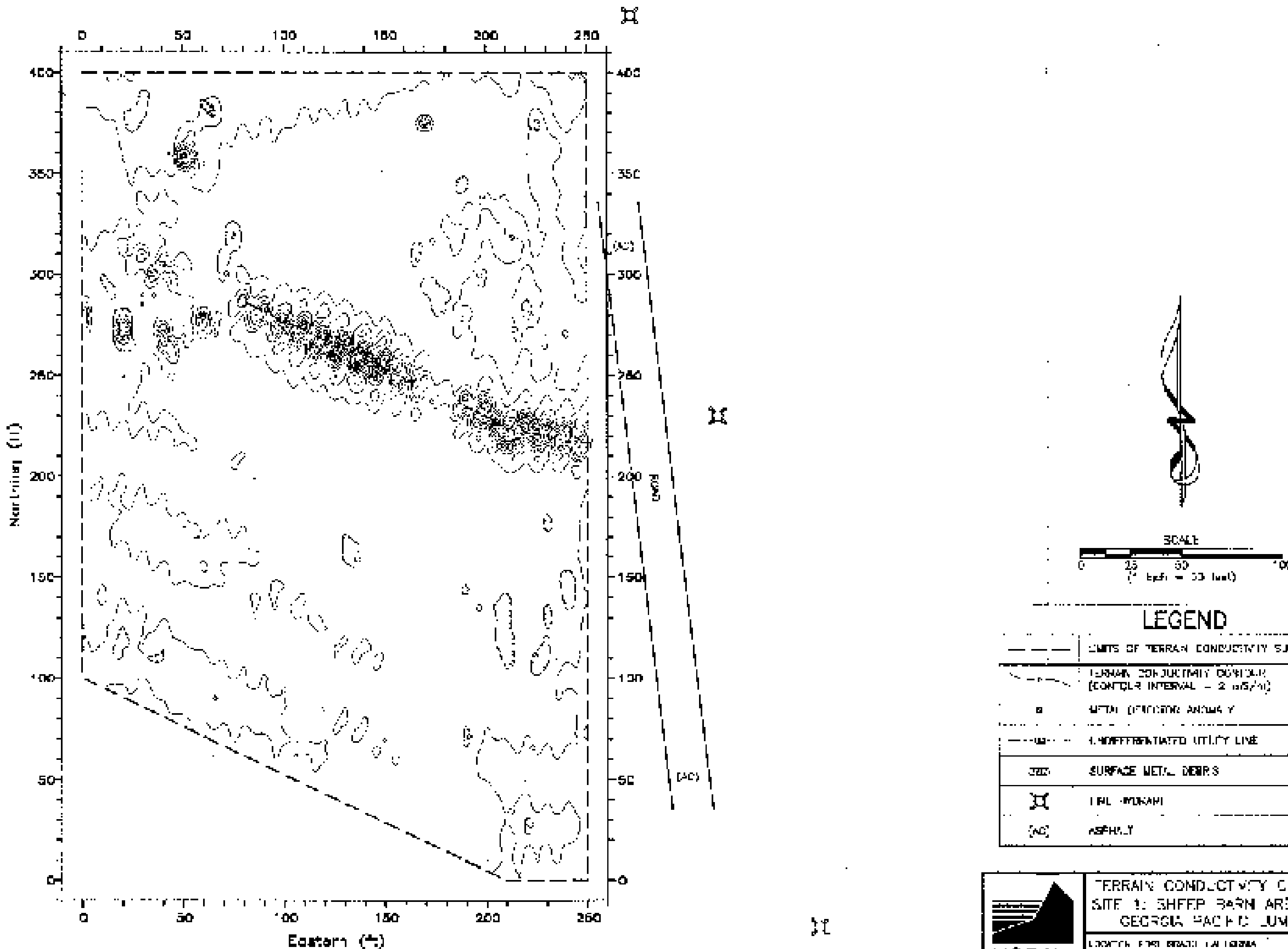

NORCAL

MAGNETIC CONTOUR MAP
SITE 1: SHEEP BARN AREA
GEORGIA PACIFIC LUMBER MILL

LOCATION: FORT BRAGG, CALIFORNIA

NORCAL GEOPHYSICAL CONSULTANTS INC.

PLATE B1




## LEGEND

| | |
|---|---|
| — — — | LIMITS OF TERRAIN CONDUCTIVITY SURVEY |
| | TERRAIN CONDUCTIVITY CONTOUR (CONTOUR INTERVAL = 2 mS/m) |
| | METAL DETECTOR ANOMALY |
| | UNDIFFERENTIATED UTILITY LINE |
| | SURFACE METAL DEBRIS |
| | FIRE HYDRANT |
| (AC) | ASPHALT |

TERRAIN CONDUCTIVITY CONTOUR MAP
SITE 1: SHEEP BARN AREA (TRC-8.4)
GEORGIA PACIFIC LUMBER MILL

NORCAL

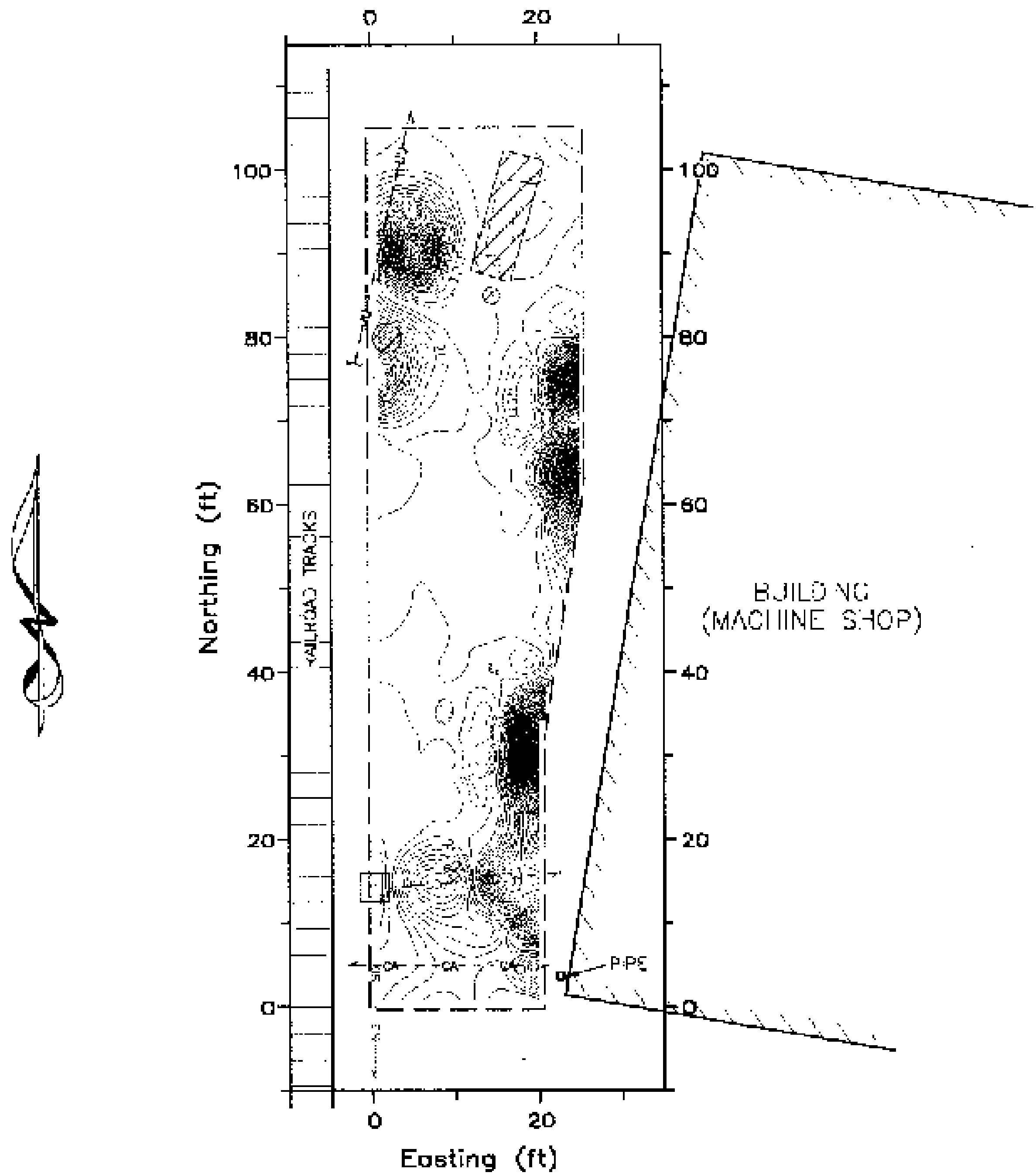
LOCATION: FORT BRAGG, CALIFORNIA

CLIENT: TRC

NORCAL GEOPHYSICAL CONSULTANTS INC.

DATE: MAR. 2003 | DRAWN BY: CRANDALL | APPROVED BY: DPI

PLATE B2

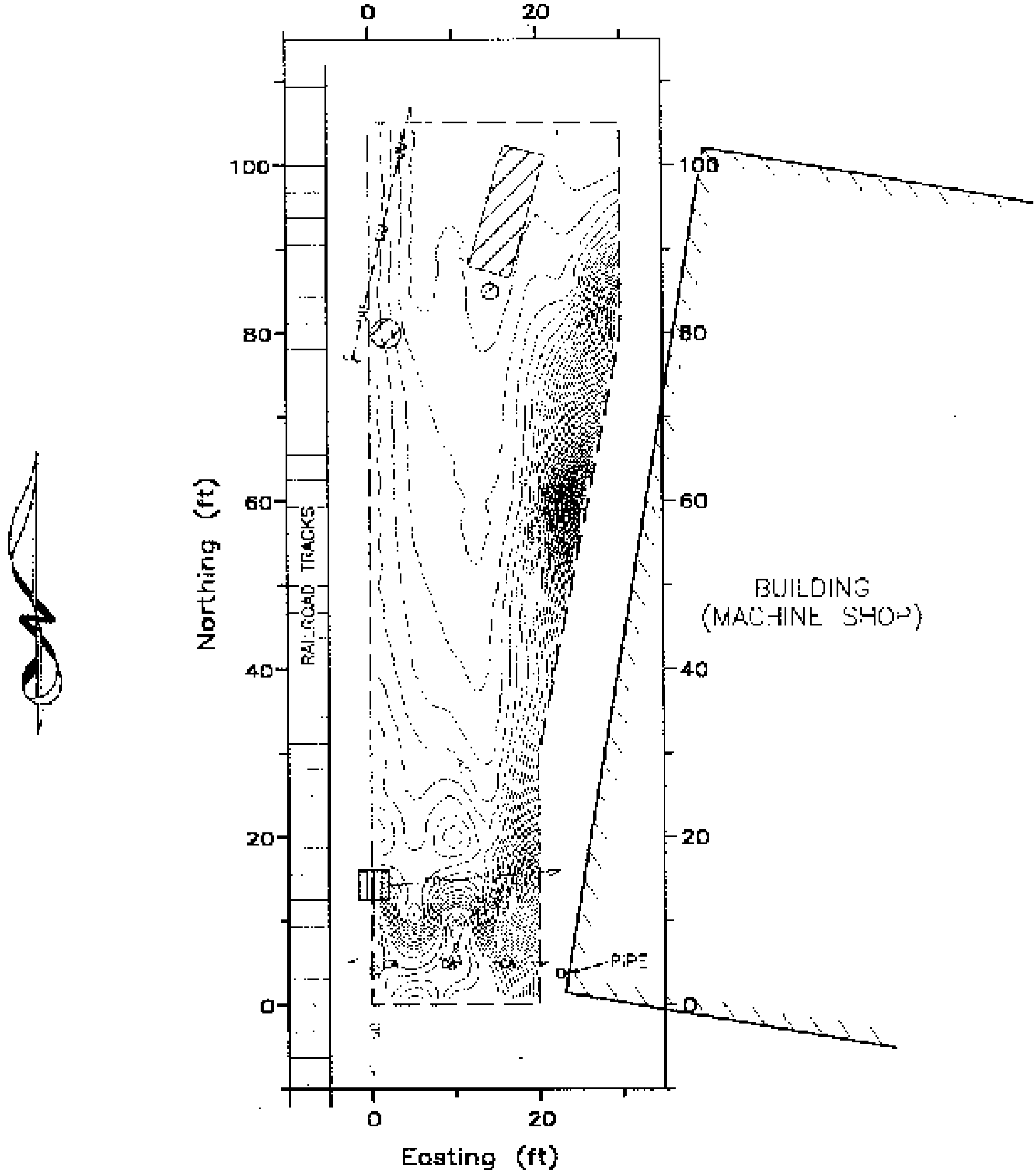



## LEGEND

| | |
|---|---|
| — — — | LIMITS OF MAGNETIC SURVEY |
| | VERTICAL MAGNETIC GRADIENT CONTOUR (CONTOUR INTERVAL = 100 nT/m) |
| | METAL DETECTOR ANOMALY |
| ---CA--- | COMPRESSED AIR LINE |
| ---SD--- | STORM DRAIN LINE |
| ---UU--- | UNDIFFERENTIATED UTILITY LINE |
| | CATCH BASIN |

SCALE
0 10 20 40
(1 inch = 20 feet)

| | | | |
|---|---|---|---|
| NORCAL | MAGNETIC CONTOUR MAP<br>SITE 2: MACHINE SHOP AREA (TRC 3.13)<br>GEORGIA PACIFIC LUMBER MILL | | |
| | LOCATION: FORT BRAGG, CALIFORNIA | | |
| | CLIENT: TRC | | PLATE |
| JOB #: 03-244.36 | NORCAL GEOPHYSICAL CONSULTANTS INC. | | B3 |
| DATE: MAR. 2003 | DRAWN BY: G.RANDALL | APPROVED BY: DPJ | |

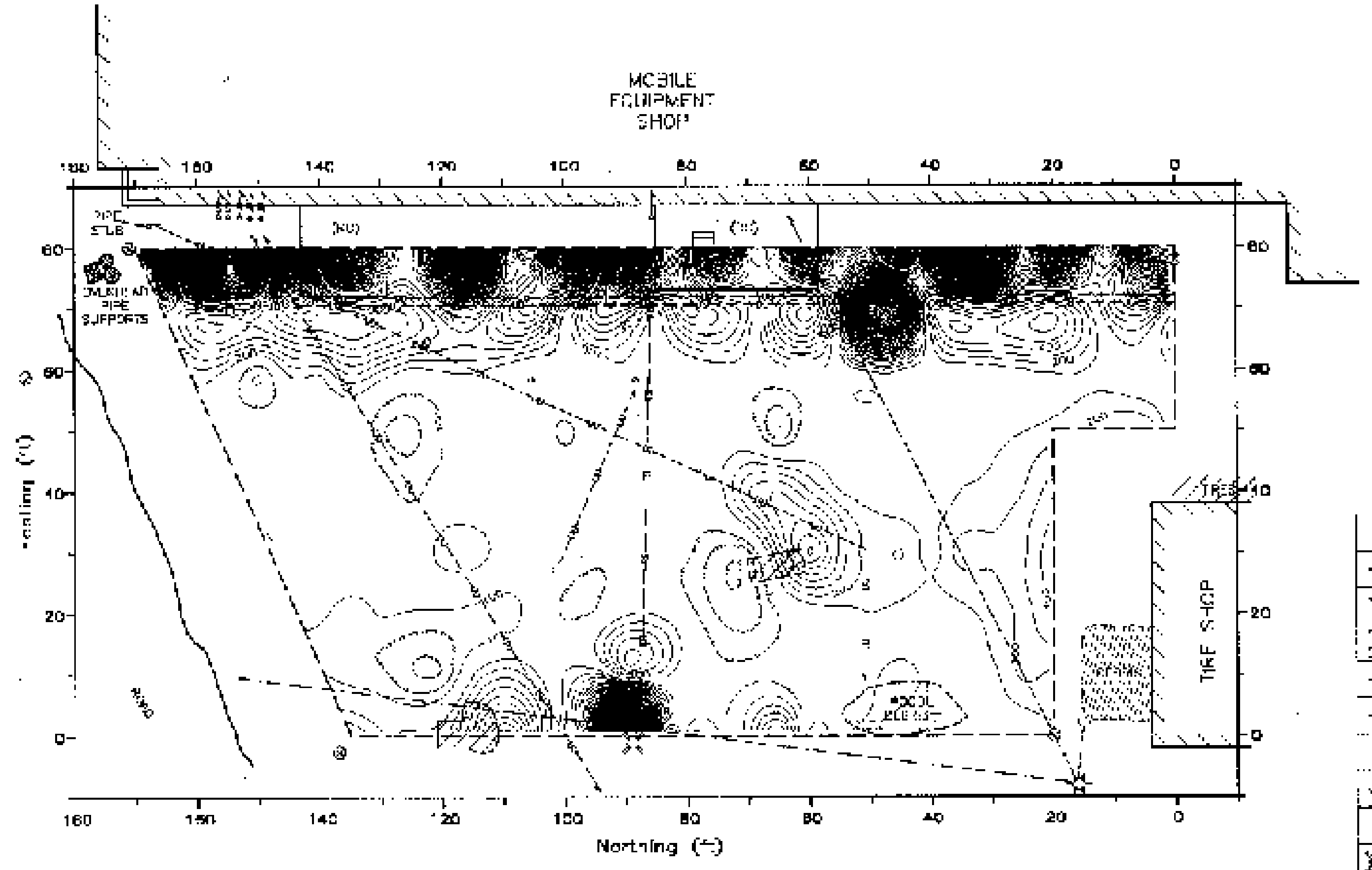


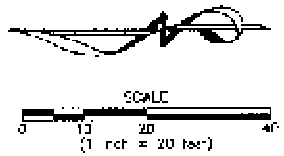

## LEGEND

| | |
|---|---|
| | LIMITS OF TERRAIN CONDUCTIVITY SURVEY |
| | TERRAIN CONDUCTIVITY CONTOUR (CONTOUR INTERVAL = 5 mS/m) |
| | METAL DETECTOR ANOMALY |
| —CA— | COMPRESSED AIR LINE |
| —SD— | STORM DRAIN LINE |
| —UU— | UNDIFFERENTIATED UTILITY LINE |
| | CATCH BASIN |

SCALE
0 10 20 40
(1 inch = 20 feet)

| | | |
|---|---|---|
| NORCAL | TERRAIN CONDUCTIVITY CONTOUR MAP<br>SITE 2: MACHINE SHOP AREA (TRC-3.13)<br>GEORGIA PACIFIC LUMBER MILL | |
| | LOCATION: FORT BRAGG, CALIFORNIA | |
| | CLIENT: TRC | PLATE |
| JOB #: 03-244.36 | NORCAL GEOPHYSICAL CONSULTANTS INC. | B4 |
| DATE: MAR. 2003 | DRAWN BY: G.RANDALL / APPROVED BY: DPJ | |




## LEGEND

| | |
|---|---|
| | LIMITS OF MAGNETIC SURVEY |
| | VERTICAL MAGNETIC GRADIENT CONTOUR (CONTOUR INTERVAL = 100 nT/m) |
| | METAL DETECTOR ANOMALY |
| | FIRE SUPPRESSION LINE |
| | OVERHEAD UTILITY LINE |
| | UNDERGROUND UTILITY LINE |
| | SURFACE METAL DEBRIS |
| | CATCH BASIN |
| | FIRE HYDRANT/HOSE BOX/STAND-UP VALVE |
| | TRC STAKE |
| | UTILITY POLE/GUY WIRE |
| (NC) | NON-ORIGINAL CONCRETE |

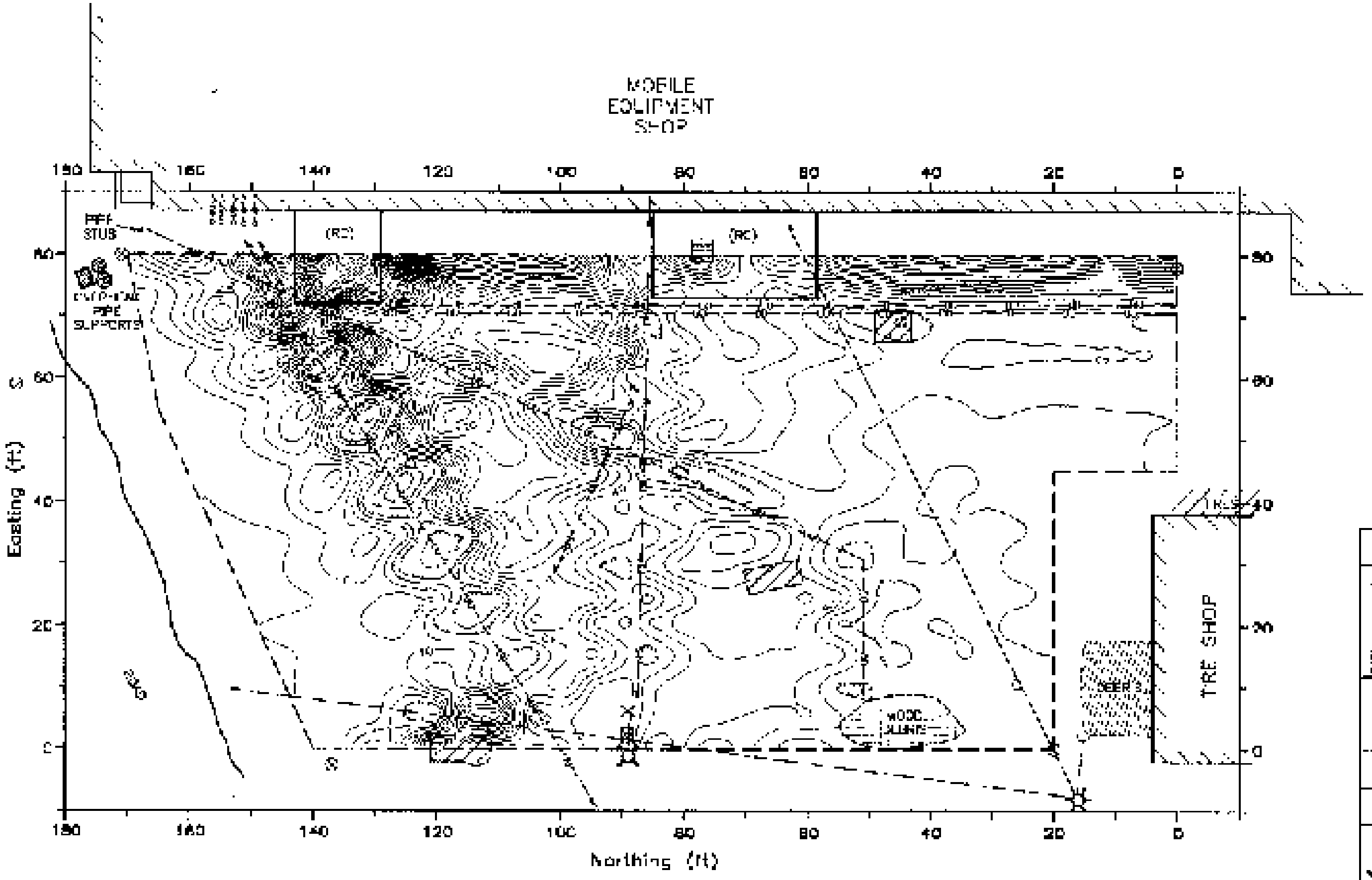
NORCAL

MAGNETIC CONTOUR MAP
SITE 3: MOBILE EQUIPMENT SHOP AREA
(TRC-5.3)
GEORGIA PACIFIC LUMBER MILL

NORCAL GEOPHYSICAL CONSULTANTS INC.

DRAWN BY: C.RANDALL

PLATE
B5




SCALE
0 10 20 40
(1 inch = 20 feet)

## LEGEND

| | |
|---|---|
| — — — | LIMITS OF TERRAIN CONDUCTIVITY SURVEY |
| | TERRAIN CONDUCTIVITY CONTOUR (CONTOUR INTERVAL = 10 mS/m) |
| | METAL DETECTOR ANOMALY |
| | FIRE SUPPRESSION LINE |
| | OVERHEAD UTILITY LINE |
| | UNDIFFERENTIATED UTILITY LINE |
| | SURFACE METAL DEBRIS |
| | CATCH BASIN |
| | FIRE HYDRANT/HOSE BOX/STAND-UP VALVE |
| | TRS STAKE |
| | UTILITY POLE/GUY WIRE |
| (RC) | REINFORCED CONCRETE |

TERRAIN CONDUCTIVITY CONTOUR MAP
SITE 3: MOBILE EQUIPMENT SHOP AREA
(IRC-3.5)
GEORGIA PACIFIC LUMBER MILL

LOCATION: FORT BRAGG, CALIFORNIA

CLIENT: TRC

NORCAL GEOPHYSICAL CONSULTANTS INC.

NORCAL

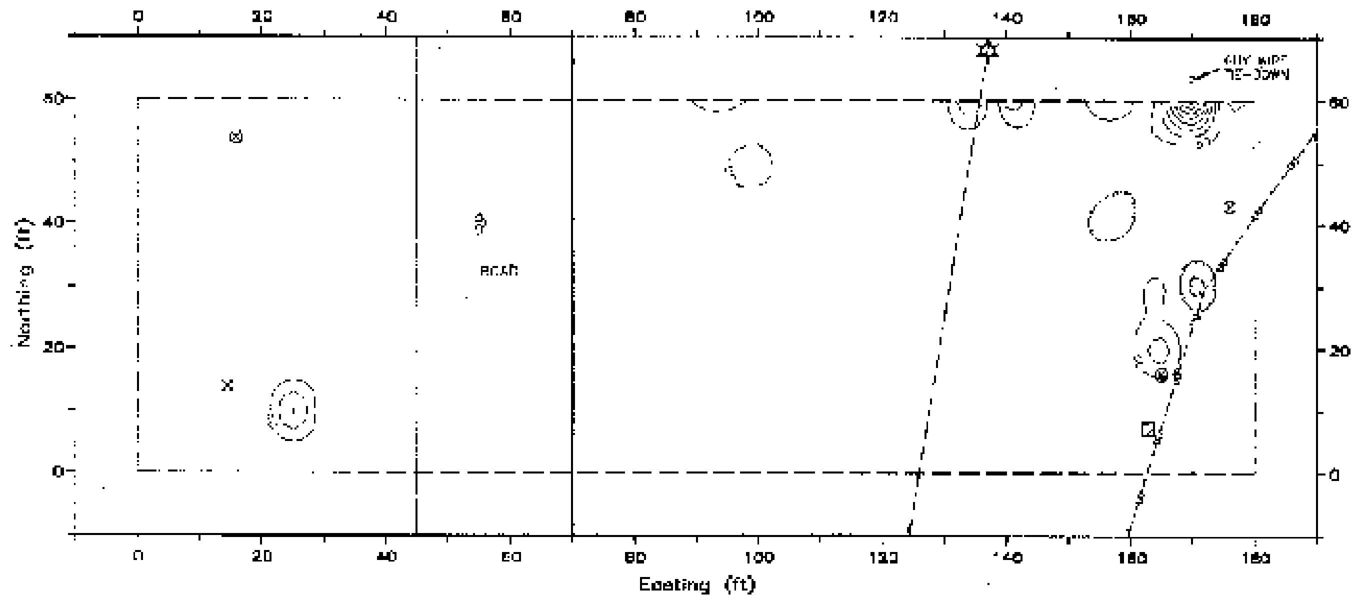
JOB #: 03 344.35

DATE: MAR 2003

DRAWN BY: [illegible]

APPROVED BY: [illegible]

PLATE
B6




## LEGEND

| | |
|---|---|
| — — — | LIMITS OF MAGNETIC SURVEY |
| | VERTICAL MAGNETIC GRADIENT CONTOUR (CONTOUR INTERVAL = 50 nT/m) |
| | METAL DETECTOR ANOMALY |
| | OVERHEAD UTILITY LINE |
| | UNDIFFERENTIATED UTILITY LINE |
| | TRC STAKE |
| | UTILITY POLE |

SCALE
0 10 20 40
(1 inch = 20 feet)

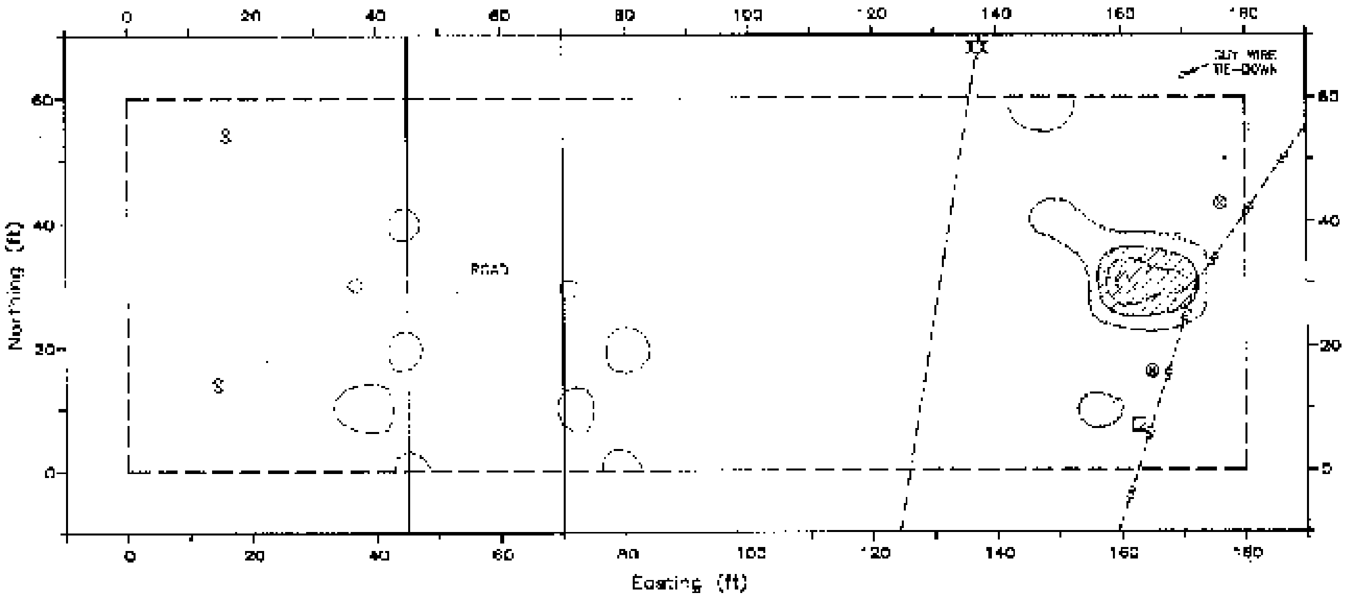
NORCAL

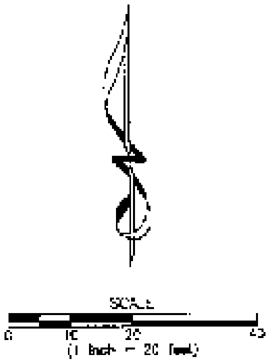
MAGNETIC CONTOUR MAP
SITE 4, SCRAP METAL AREA (TRC-3.2)
GEORGIA PACIFIC LUMBER MILL

CLIENT: TRC

NORCAL GEOPHYSICAL CONSULTANTS, INC.

PLATE B7



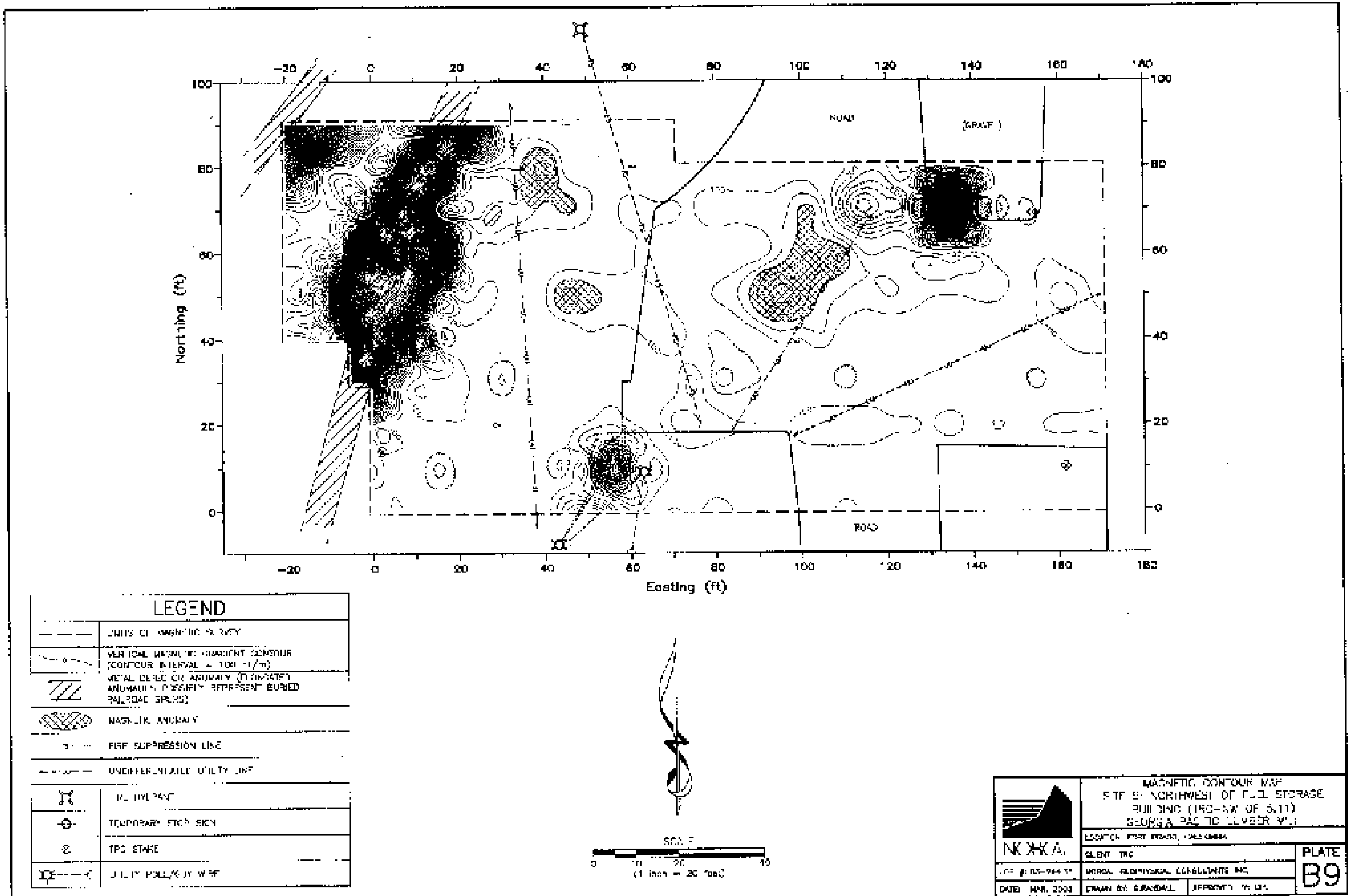

## LEGEND

| | |
|---|---|
| | LIMITS OF TERRAIN CONDUCTIVITY SURVEY |
| | TERRAIN CONDUCTIVITY CONTOUR (CONTOUR INTERVAL = 1 mS/m) |
| | TERRAIN CONDUCTIVITY ANOMALY |
| | METAL DETECTOR ANOMALY |
| | OVERHEAD UTILITY LINE |
| | UNDERGROUND (UNLOCATED) UTILITY LINE |
| S | TRC STAKE |
| | UTILITY POLE |

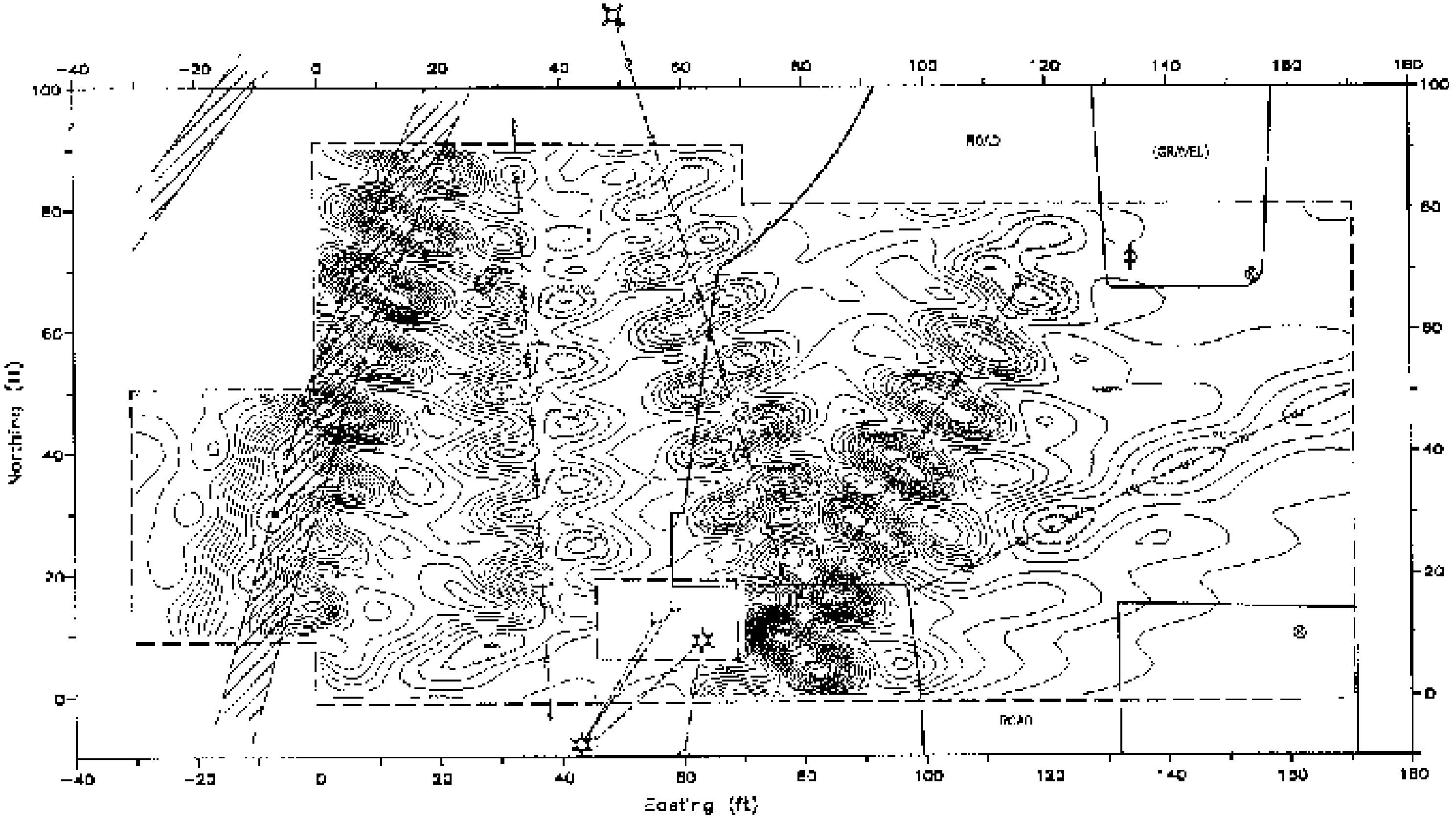
TERRAIN CONDUCTIVITY CONTOUR MAP
SITE 4: SCRAP METAL AREA (TRC-3.2)
GEORGIA PACIFIC LUMBER MILL

| | |
|---|---|
| NORCAL | LOCATION: FORT BRAGG, CALIFORNIA |
| | CLIENT: TRC |
| JOB #: [illegible] | NORCAL GEOPHYSICAL CONSULTANTS INC. |
| DATE: MAR. 2005 | DRAWN BY: G.RANDALL · APPROVED BY: [illegible] |

PLATE B8



Northing (ft)
Easting (ft)
ROAD
(GRAVEL)
ROAD
LEGEND
LIMITS OF MAGNETIC SURVEY
VERTICAL MAGNETIC GRADIENT CONTOUR (CONTOUR INTERVAL = 100 nT/m)
METAL DETECTOR ANOMALY (ELONGATED ANOMALIES POSSIBLY REPRESENT BURIED RAILROAD SPURS)
MAGNETIC ANOMALY
FIRE SUPPRESSION LINE
UNDIFFERENTIATED UTILITY LINE
FIRE HYDRANT
TEMPORARY STOP SIGN
TPS STAKE
UTILITY POLE/GUY WIRE
SCALE
(1 inch = 20 feet)
MAGNETIC CONTOUR MAP
SITE 5: NORTHWEST OF FUEL STORAGE BUILDING (TPS-NW OF 5.11)
GEORGIA PACIFIC LUMBER MILL
LOCATION: FORT BRAGG, CALIFORNIA
CLIENT: TRC
NORCAL GEOPHYSICAL CONSULTANTS INC.
DRAWN BY: RANDALL
DATE: MAR. 2003
PLATE
B9




## LEGEND

| | |
|---|---|
| | LIMITS OF TERRAIN CONDUCTIVITY SURVEY |
| | TERRAIN CONDUCTIVITY CONTOUR (CONTOUR INTERVAL = 10 mS/m) |
| | METAL DETECTOR ANOMALY (ELONGATED ANOMALIES POSSIBLY REPRESENT BURIED RAILROAD SPURS) |
| | FIRE SUPPRESSION LINE |
| | UNDIFFERENTIATED UTILITY LINE |
| | FIRE HYDRANT |
| | TEMPORARY STOP SIGN |
| | TIC STAKE |
| | UTILITY POLE/GUY WIRE |

SCALE

0 10 20 40

(1 inch = 20 feet)

TERRAIN CONDUCTIVITY CONTOUR MAP
SITE 5 NORTHWEST OF FUEL STORAGE
BUILDING (TRC-NW OF 5.1')
GEORGIA PACIFIC LUMBER MILL

LOCATION: FORT BRAGG, CALIFORNIA

CLIENT: TRC

NORCAL GEOPHYSICAL CONSULTANTS INC.

NORCAL

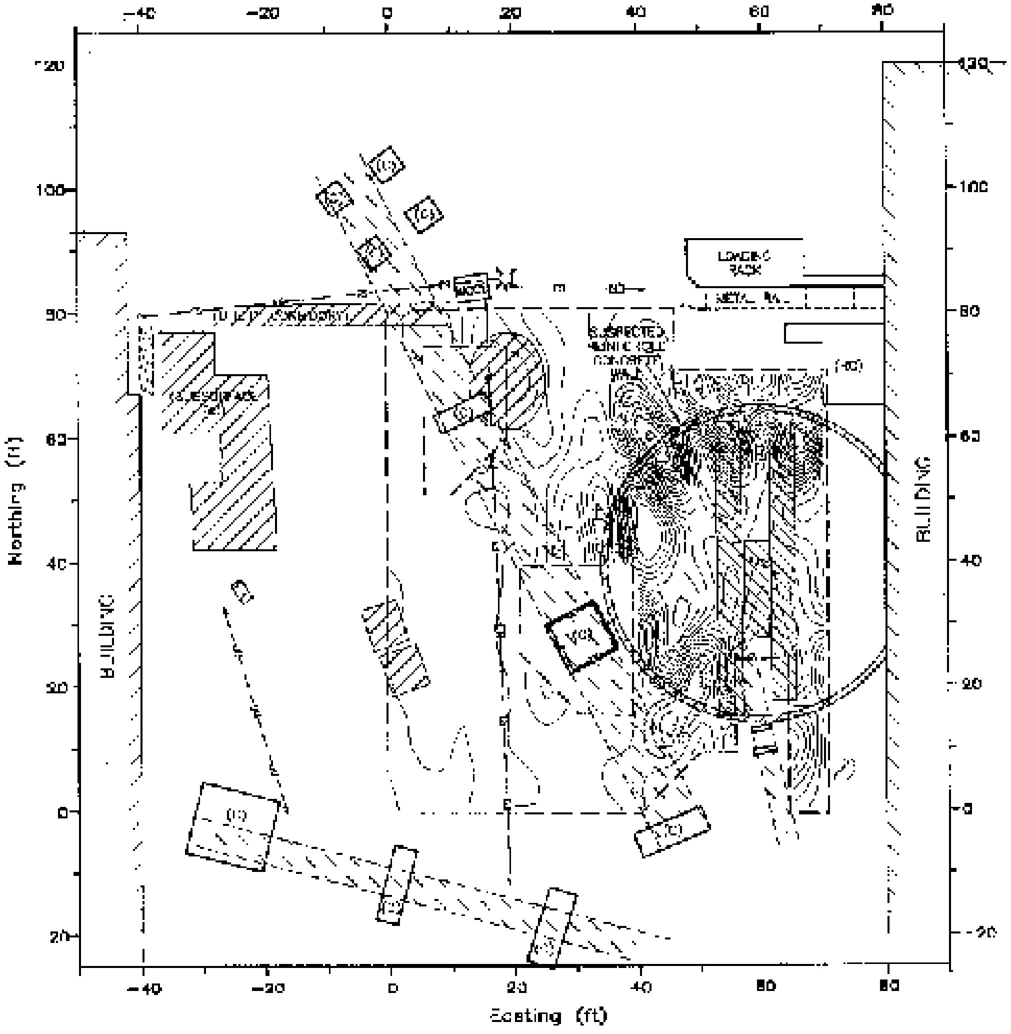
JOB #: 03-344.32

DATE: MAR. 2003

DRAWN BY: GRANDALL

APPROVED BY: DP.

PLATE B10




## LEGEND

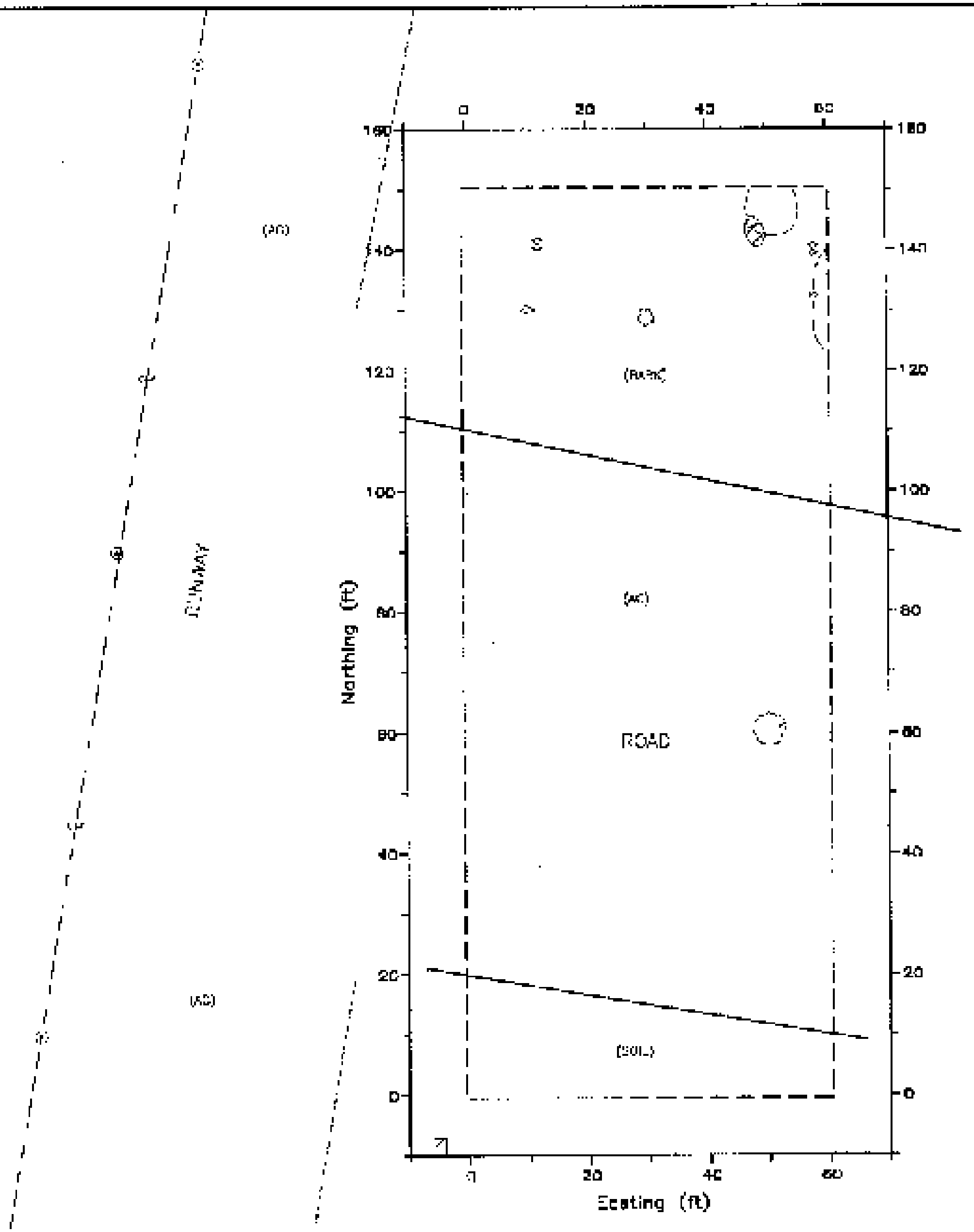
| | |
|---|---|
| | LIMITS OF TERRAIN CONDUCTIVITY SURVEY |
| | TERRAIN CONDUCTIVITY CONTOUR (CONTOUR INTERVAL = 20 mS/m) |
| | METAL DETECTOR ANOMALY |
| | METAL DETECTOR AND GPR ANOMALY |
| | FIRE SUPPRESSION LINE |
| | FIRE SUPPRESSION LINE LOCATED BY VISUAL ALIGNMENT OF VALVES/PIPES (NOT DETECTED) |
| | UNDIFFERENTIATED UTILITY LINE |
| | SUSPECTED UTILITY LINE |
| | FENCE |
| | OVERHEAD CONVEYOR |
| | SURFACE METAL |
| | FIRE HYDRANT |
| (C) | CONCRETE |
| (RC) | REINFORCED CONCRETE |

TERRAIN CONDUCTIVITY CONTOUR MAP
SITE 6: SAWMILL NO. 2 (TRC-7.1)
GEORGIA PACIFIC LUMBER MILL

NORCAL

LOCATION: FORT BRAGG, CALIFORNIA
CLIENT: TRC
NORCAL GEOPHYSICAL CONSULTANTS INC.
JOB #: 03-244.38
DATE: MAR. 2003
DRAWN BY: G. RANDALL
APPROVED BY: DJH

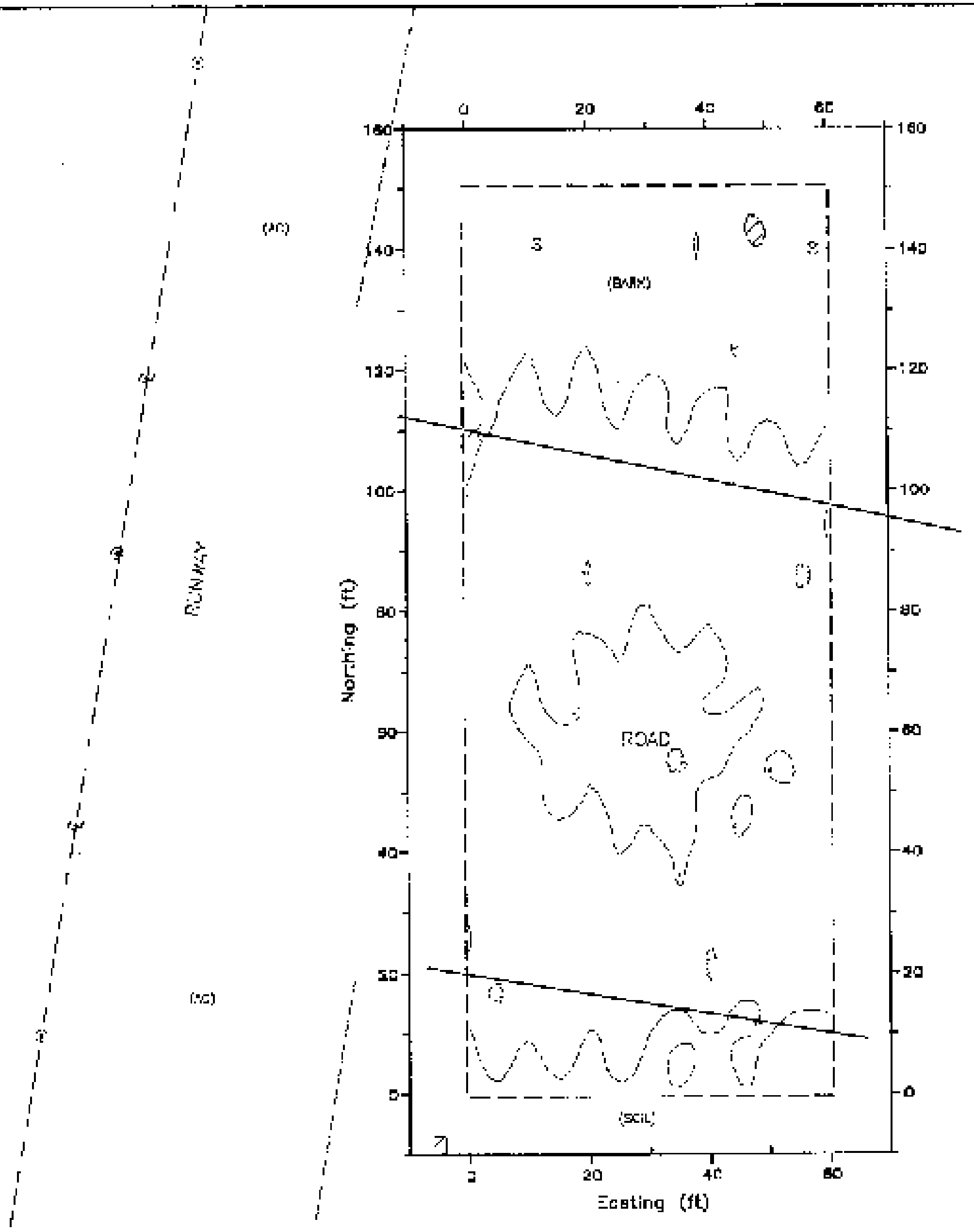
PLATE B11

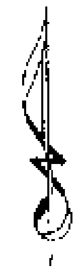



## LEGEND

| | |
|---|---|
| — — — | LIMITS OF MAGNETIC SURVEY |
| | VERTICAL MAGNETIC GRADIENT CONTOUR (CONTOUR INTERVAL = 25 nT/m) |
| | METAL DETECTOR ANOMALY |
| — ℄ — | APPROXIMATE CENTER LINE OF RUNWAY |
| ⊗ | TRC STAKE |
| ⊛ | NORCAL BRUSH FLAG |
| (AC) | ASPHALT |

| | | |
|---|---|---|
| NORCAL | MAGNETIC CONTOUR MAP SITE 7 SOUTHEAST END OF LANDING STRIP (TRC-B1) GEORGIA PACIFIC LUMBER MILL | |
| | LOCATION: FORT BRAGG, CALIFORNIA | |
| | CLIENT: TRC | PLATE B12 |
| JOB #: 03-044.06 | NORCAL GEOPHYSICAL CONSULTANTS INC. | |
| DATE: JUNE 2006 | DRAWN BY: GRANDALL | APPROVED BY: DPJ |



SCALE
0 10 20 40
(1 inch = 20 feet)

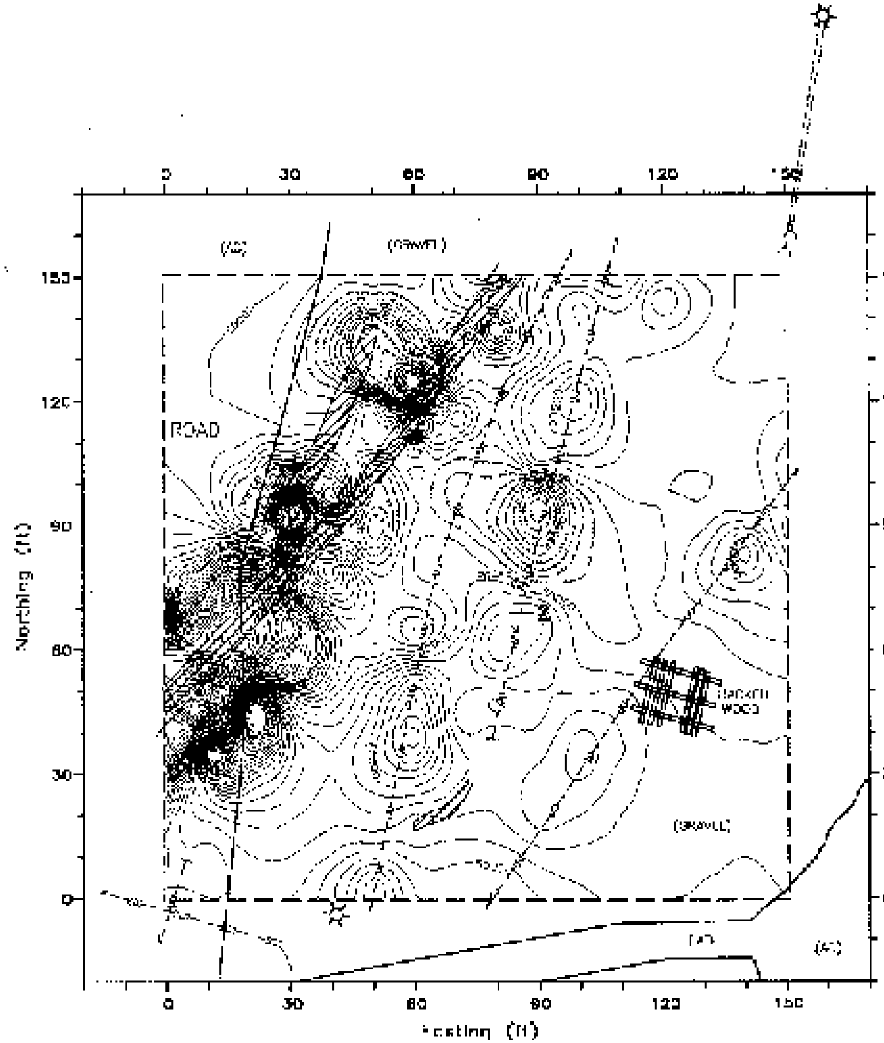
# LEGEND

| | |
|---|---|
| — — — | LIMITS OF TERRAIN CONDUCTIVITY SURVEY |
| ~ 4 ~ | TERRAIN CONDUCTIVITY CONTOUR (CONTOUR INTERVAL = 1 mS/m) |
| ▨ | METAL DETECTOR ANOMALY |
| — ℄ — | APPROXIMATE CENTER LINE OF RUNWAY |
| (+) | TRC STAKE |
| ⊛ | NORCAL TRASH FLAG |
| (AC) | ASPHALT |

TERRAIN CONDUCTIVITY CONTOUR MAP
SITE 7, SOUTHEAST END OF LANDING STRIP
(TRC 9.1)
GEORGIA PACIFIC LUMBER MILL

NORCAL

| | | |
|---|---|---|
| JOB #: 03-24-34 | LOCATION: FORT BRAGG, CALIFORNIA | PLATE |
| DATE: MAR 2003 | CLIENT: TRC | B13 |
| | NORCAL GEOPHYSICAL CONSULTANTS INC. | |
| | DRAWN BY: CRANDALL | APPROVED BY: DRC |




SCALE

0 15 30 60

(1 inch = 30 feet)

| LEGEND | |
|---|---|
| | LIMITS OF MAGNETIC SURVEY |
| | TOTAL FIELD MAGNETIC INTENSITY CONTOUR (VARIABLE CONTOUR INTERVAL: CONTOURS [illegible] = 500 nT; [illegible] = 250 nT; [illegible] = 100 nT) |
| | METAL DETECTOR ANOMALY (ELONGATED ANOMALIES REPRESENT SUSPECTED BURIED RAILROAD SPURS) |
| | SUSPECTED STORM DRAIN LINE |
| | UNDIFFERENTIATED UTILITY LINES |
| | TRC STAKE |
| | VALVE |
| | UTILITY POLE/GUY WIRE |
| (AC) | ASPHALT |

NORCAL

MAGNETIC CONTOUR MAP

SITE B: AREA EAST OF SHIPPING OFFICE

(TRC-E OF 6.4)

GEORGIA PACIFIC LUMBER MILL

LOCATION: FORT BRAGG, CALIFORNIA

CLIENT: [illegible]

JOB #: [illegible]

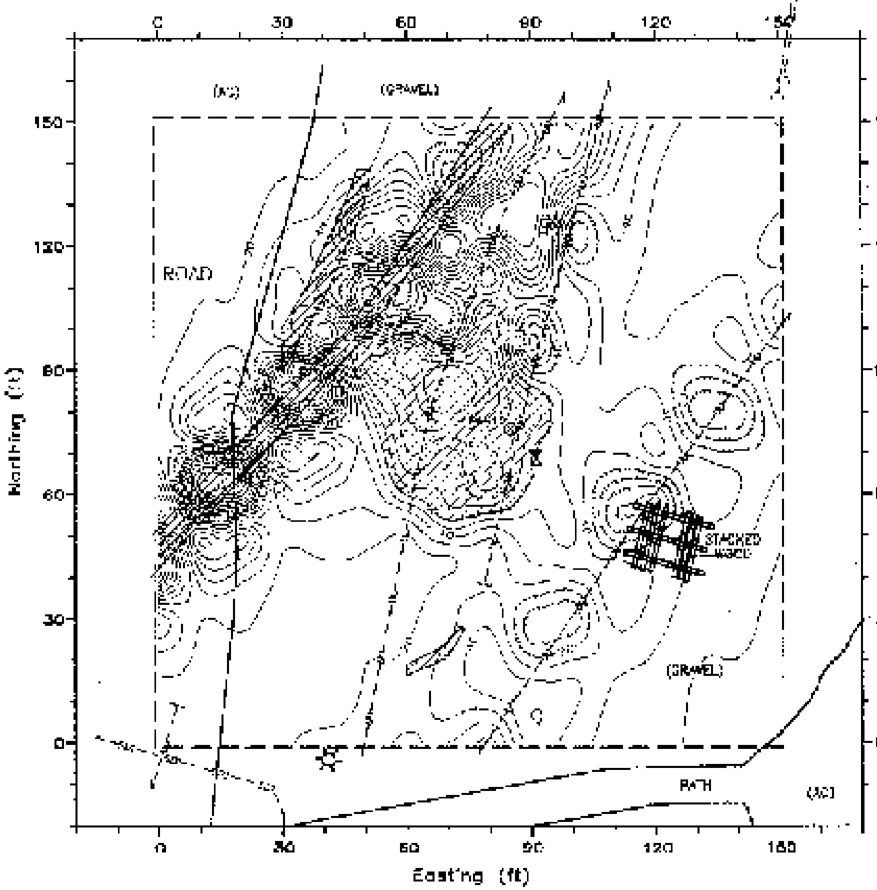
NORCAL GEOPHYSICAL CONSULTANTS INC.

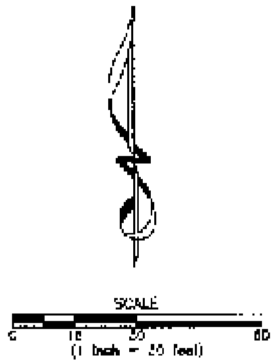
DATE: [illegible]

DRAWN BY: [illegible]

APPROVED BY: [illegible]

PLATE B14

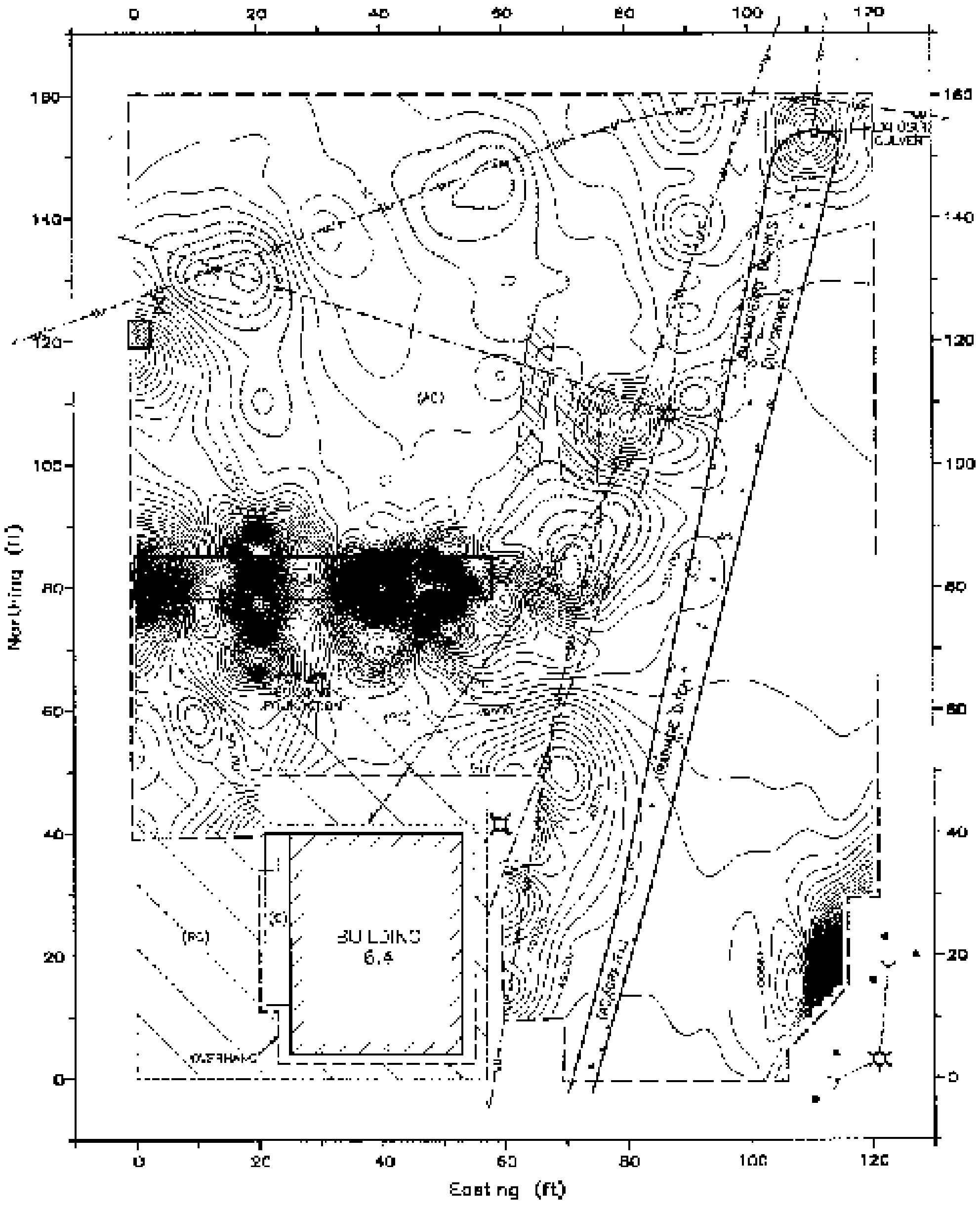


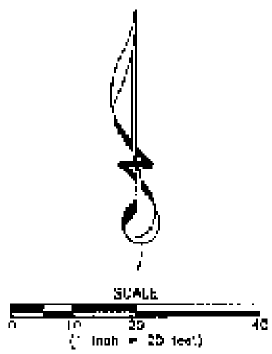




## LEGEND

| | |
|---|---|
| — — — | LIMITS OF TERRAIN CONDUCTIVITY SURVEY |
| | TERRAIN CONDUCTIVITY CONTOUR (CONTOUR INTERVAL = 10 mS/m) |
| | METAL DETECTOR ANOMALY (ELONGATED ANOMALIES REPRESENT SUSPECTED BURIED RAILROAD SPURS) |
| | TERRAIN CONDUCTIVITY ANOMALY |
| | SUSPECTED STORM DRAIN LINE |
| | UNDIFFERENTIATED UTILITY LINES |
| | PID STAKE |
| | VALVE |
| | UTILITY POLE/GUY WIRE |
| (AC) | ASPHALT |

| | | |
|---|---|---|
| NORCAL | TERRAIN CONDUCTIVITY CONTOUR MAP<br>SITE 9: AREA EAST OF SHIPPING OFFICE<br>(TRC 3 OF 4)<br>GEORGIA PACIFIC LUMBER MILL | |
| | LOCATION: FORT BRAGG, CALIFORNIA | |
| | CLIENT: TRC | PLATE |
| JOB # 98-744.36 | NORCAL GEOPHYSICAL CONSULTANTS INC. | B15 |
| DATE: JUN. 2001 | DRAWN BY: G.RANDALL | APPROVED BY: DRV | |




## LEGEND

| | |
|---|---|
| — — — | LIMITS OF MAGNETIC SURVEY |
| | TOTAL FIELD MAGNETIC INTENSITY CONTOUR (CONTOUR INTERVAL = 50 nT) |
| | GPR ANOMALY |
| | OVERHEAD UTILITY LINE |
| | STORM DRAIN LINE |
| — U — | UNDIFFERENTIATED UTILITY LINE |
| | FIRE HYDRANT |
| • | PARKING BOLLARD |
| | UTILITY BOX |
| | UTILITY POLE/GUY WIRE |
| | VALVE |
| (AC) | ASPHALT |
| (C) | CONCRETE |
| (RC) | REINFORCED CONCRETE |

MAGNETIC CONTOUR MAP
SITE 6: SHIPPING OFFICE AREA (TRC-6.4)
GEORGIA PACIFIC LUMBER MILL

LOCATION: FORT BRAGG, CALIFORNIA

NORCAL

JOB #: 03-344.05

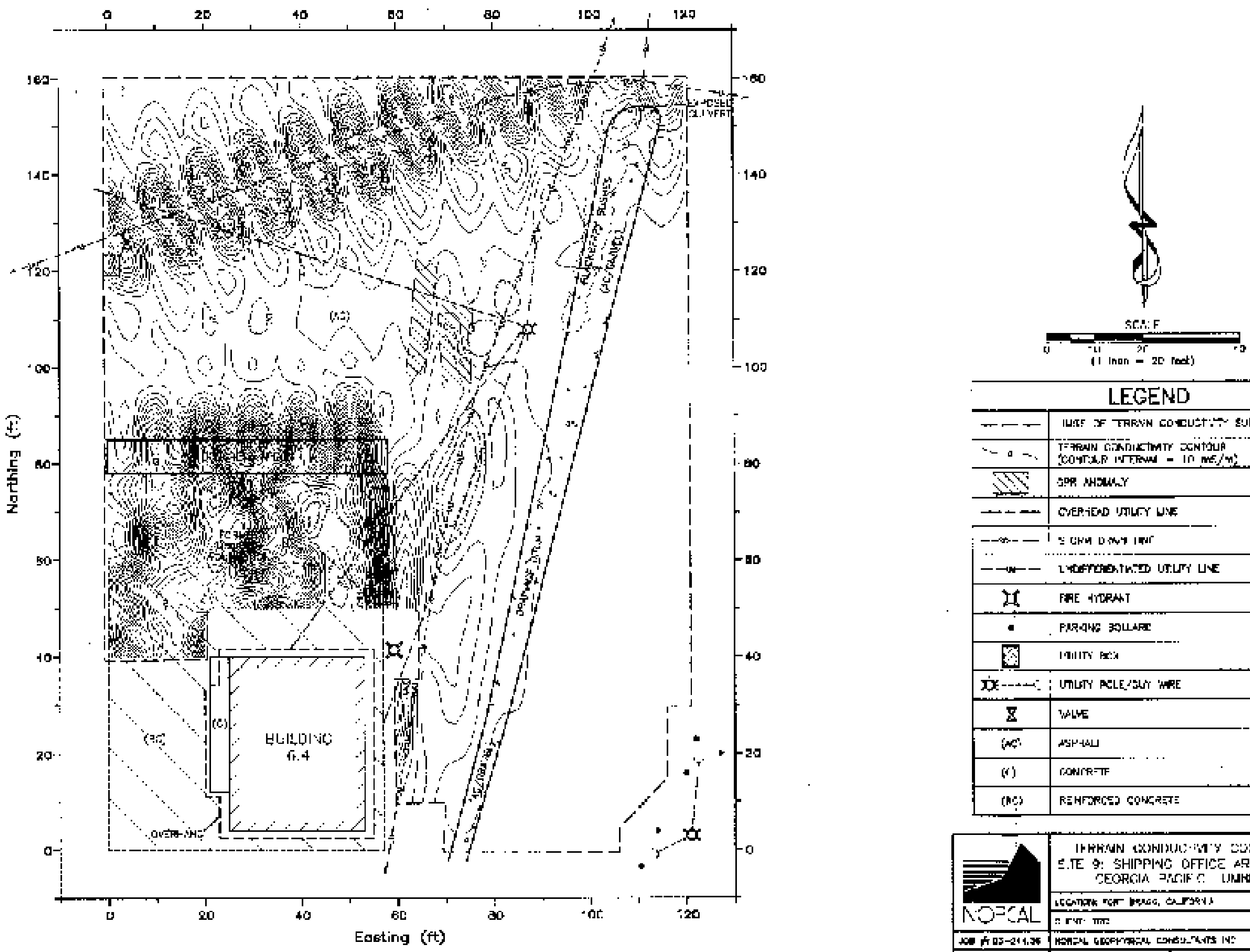
DATE: MAR. 2003

NORCAL GEOPHYSICAL CONSULTANTS INC.

DRAWN BY: G.RANDALL

APPROVED BY: DP

PLATE
B16




## LEGEND

| | |
|---|---|
| | LIMIT OF TERRAIN CONDUCTIVITY SURVEY |
| | TERRAIN CONDUCTIVITY CONTOUR (CONTOUR INTERVAL = 10 mS/m) |
| | GPR ANOMALY |
| | OVERHEAD UTILITY LINE |
| | STORM DRAIN LINE |
| | UNDIFFERENTIATED UTILITY LINE |
| | FIRE HYDRANT |
| | PARKING BOLLARD |
| | UTILITY BOX |
| | UTILITY POLE/GUY WIRE |
| | VALVE |
| (AC) | ASPHALT |
| (C) | CONCRETE |
| (RC) | REINFORCED CONCRETE |

NORCAL

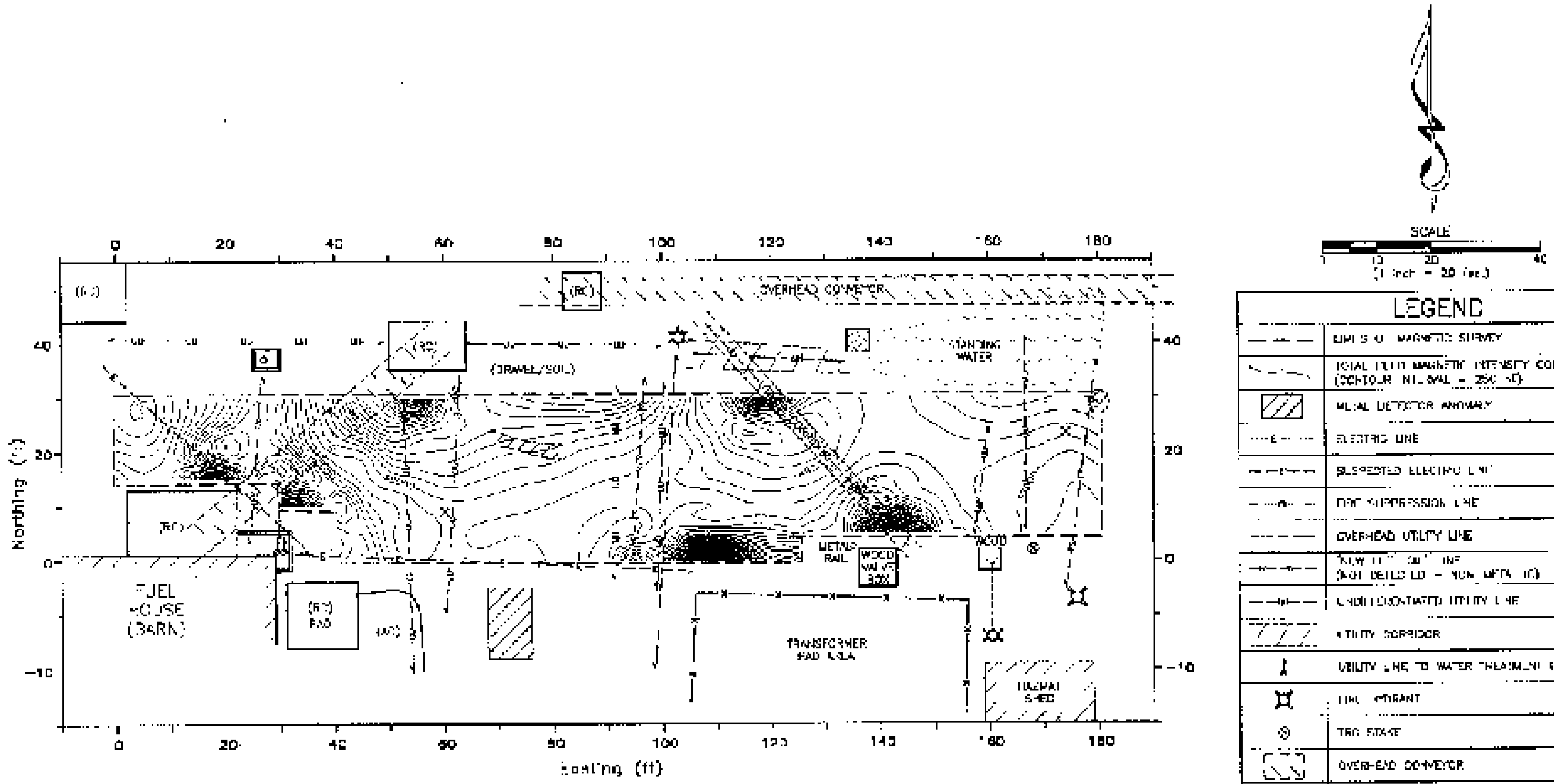
TERRAIN CONDUCTIVITY CONTOUR MAP
SITE 9: SHIPPING OFFICE AREA (TRC-6.4)
GEORGIA PACIFIC LUMBER MILL

LOCATION: FORT BRAGG, CALIFORNIA

CLIENT: TRC

NORCAL GEOPHYSICAL CONSULTANTS INC

PLATE
B17




## LEGEND

| | |
|---|---|
| | LIMITS OF MAGNETIC SURVEY |
| | TOTAL FIELD MAGNETIC INTENSITY CONTOUR (CONTOUR INTERVAL = 250 nT) |
| | METAL DETECTOR ANOMALY |
| | ELECTRIC LINE |
| | SUSPECTED ELECTRIC LINE |
| | FIRE SUPPRESSION LINE |
| | OVERHEAD UTILITY LINE |
| | NEW UTILITY LINE (NOT DETECTED - NON METALLIC) |
| | UNIDENTIFIED/UNTESTED UTILITY LINE |
| | UTILITY CORRIDOR |
| | UTILITY LINE TO WATER TREATMENT BUILDING |
| | FIRE HYDRANT |
| | TRC STAKE |
| | OVERHEAD CONVEYOR |
| | UTILITY BOX |
| | UTILITY POLE/GUY WIRE |
| | FENCE |
| (AC) | ASPHALT |
| (RC) | REINFORCED CONCRETE |

NORCAL

MAGNETIC CONTOUR MAP
SITE 10: NORTHEAST OF FUEL BARN
(TRC-N OF 4.7, 4.9, 4.10)
GEORGIA PACIFIC LUMBER MILL

LOCATION: FORT BRAGG, CALIFORNIA

CLIENT: TRC

NORCAL GEOPHYSICAL CONSULTANTS INC.

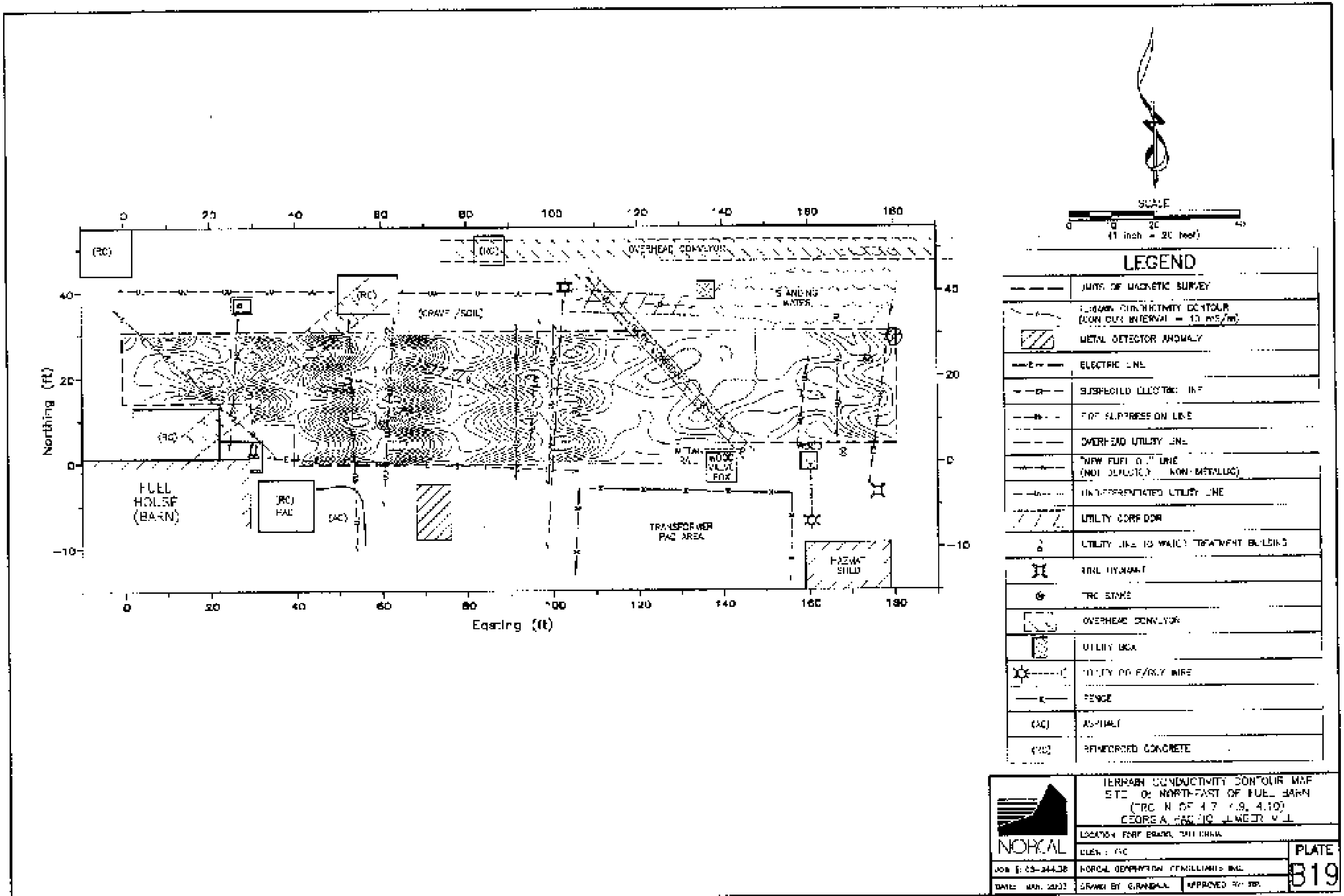
JOB #: 03-344.35

DATE: MAR. 2004

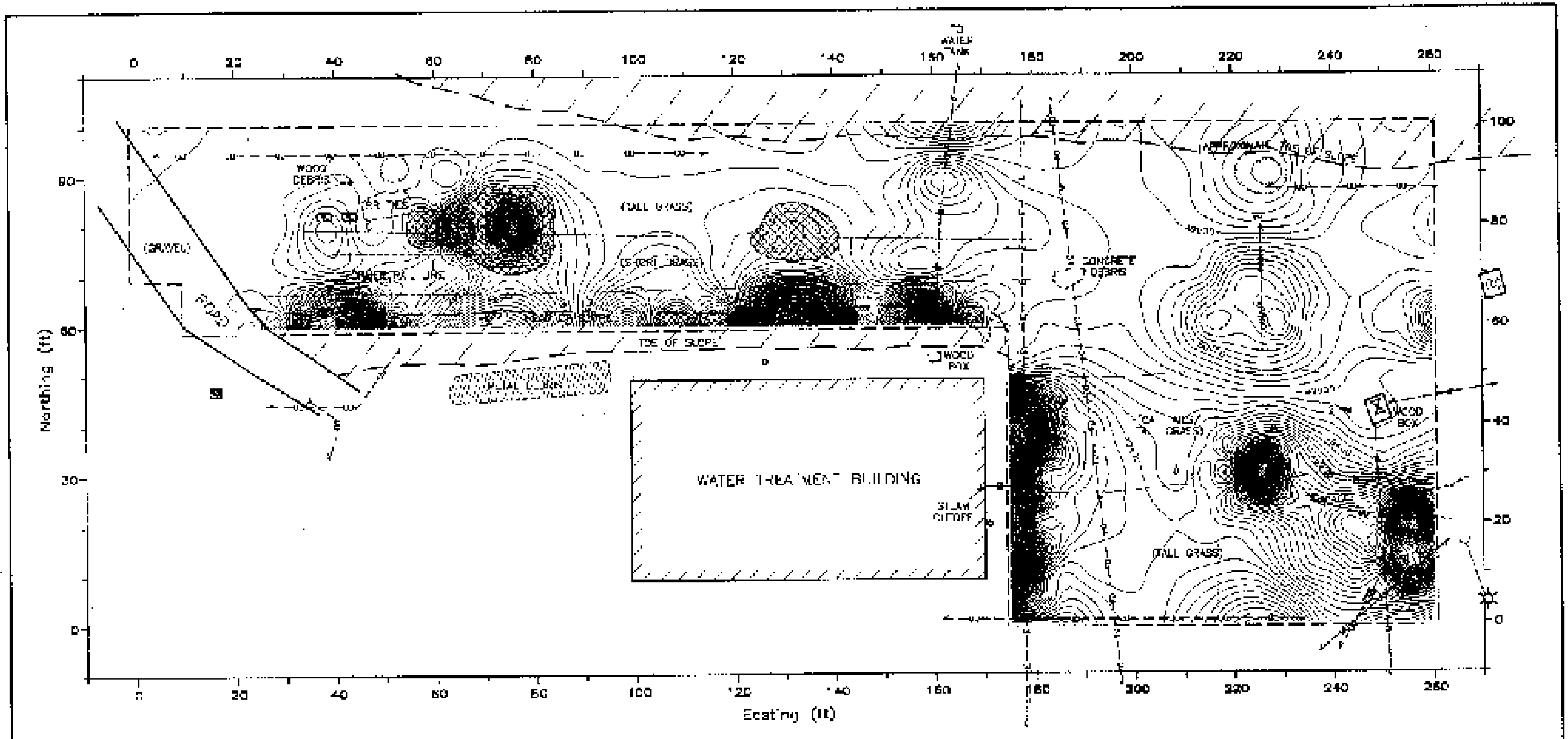
DRAWN BY: C.RANDALL

APPROVED BY: GR

PLATE B18



SCALE
(1 inch = 20 feet)
LEGEND
LIMITS OF MAGNETIC SURVEY
TERRAIN CONDUCTIVITY CONTOUR (CONTOUR INTERVAL = 10 mS/m)
METAL DETECTOR ANOMALY
ELECTRIC LINE
SUSPECTED ELECTRIC LINE
OVERHEAD UTILITY LINE
UTILITY CORRIDOR
FIRE HYDRANT
TRC STAKE
OVERHEAD CONVEYOR
UTILITY BOX
FENCE
ASPHALT
REINFORCED CONCRETE
OVERHEAD CONVEYOR
STANDING WATER
TRANSFORMER PAD AREA
HAZMAT SHED
FUEL HOUSE (BARN)
Northing (ft)
Easting (ft)
TERRAIN CONDUCTIVITY CONTOUR MAP
LOCATION: FORT BRAGG, CALIFORNIA
NORCAL
NORCAL GEOPHYSICAL CONSULTANTS INC.
PLATE
B19




# LEGEND

| | | | |
|---|---|---|---|
| — — — | LIMITS OF MAGNETIC SURVEY | —·—·— | WATER LINE |
| | TOTAL FIELD MAGNETIC INTENSITY CONTOUR (CONTOUR INTERVAL = 100 nT) | | TIE |
| | MAGNETIC ANOMALY | | SURFACE METAL/REBAR |
| —E— | ELECTRIC LINE | | UTILITY POLE/GUY WIRE |
| F | FUEL OIL LINE* | | VAULT |
| - UU - | UNDIFFERENTIATED UTILITY LINE | (C) | CONCRETE |
| | EXPOSED PIPE | (RC) | REINFORCED CONCRETE |

*FUEL OIL LINE NOT DETECTED; APPROXIMATE LOCATION SHOWN FROM VISUAL ALIGNMENT OF PIPE ENTERING GROUND AT NORTHEAST CORNER OF FUEL BARN (4.2) AND SOUTHWEST CORNER OF POWER HOUSE FUEL STORAGE SHED (4.1)

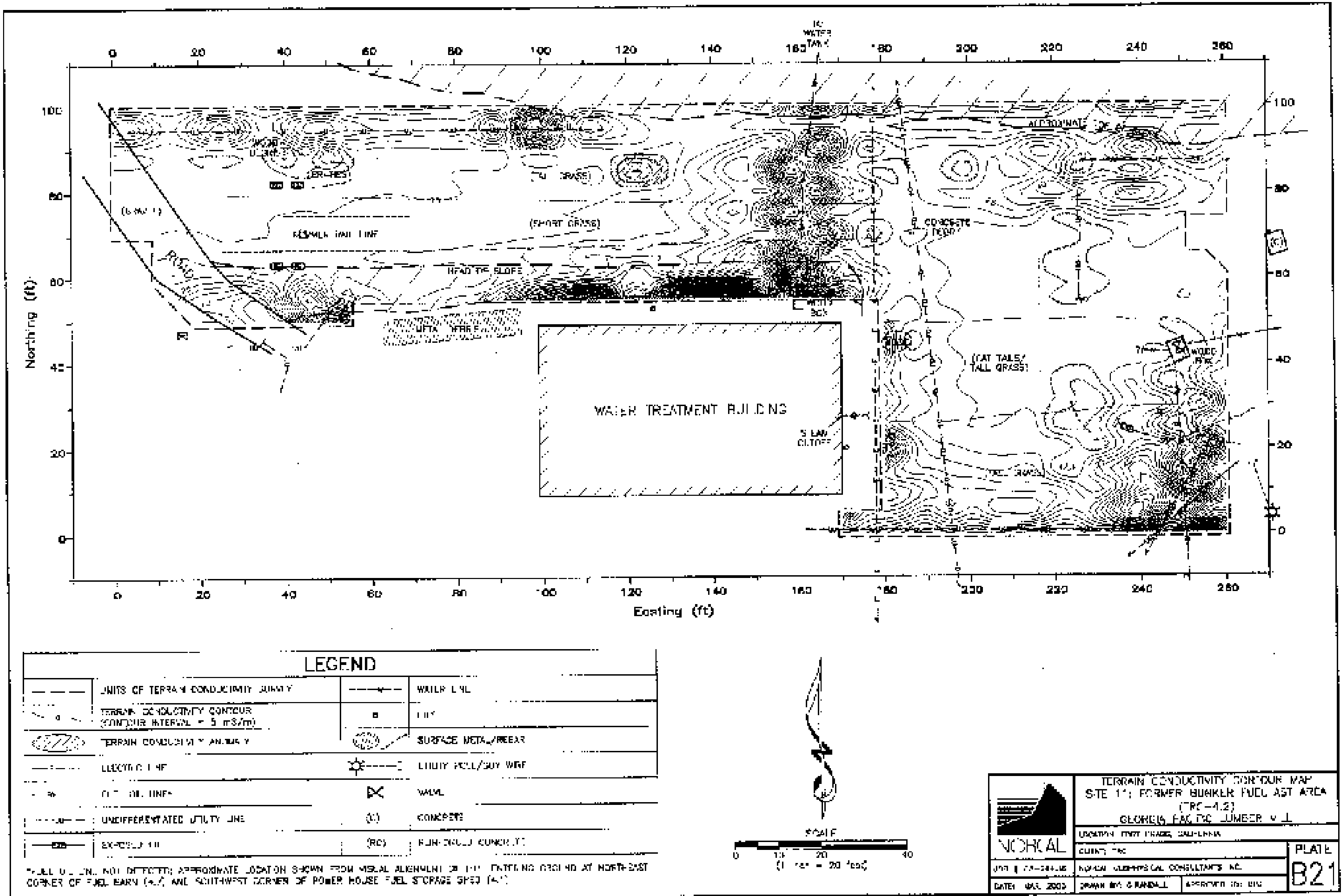
SCALE
0 10 20 40
(1 inch = 20 feet)

NORCAL

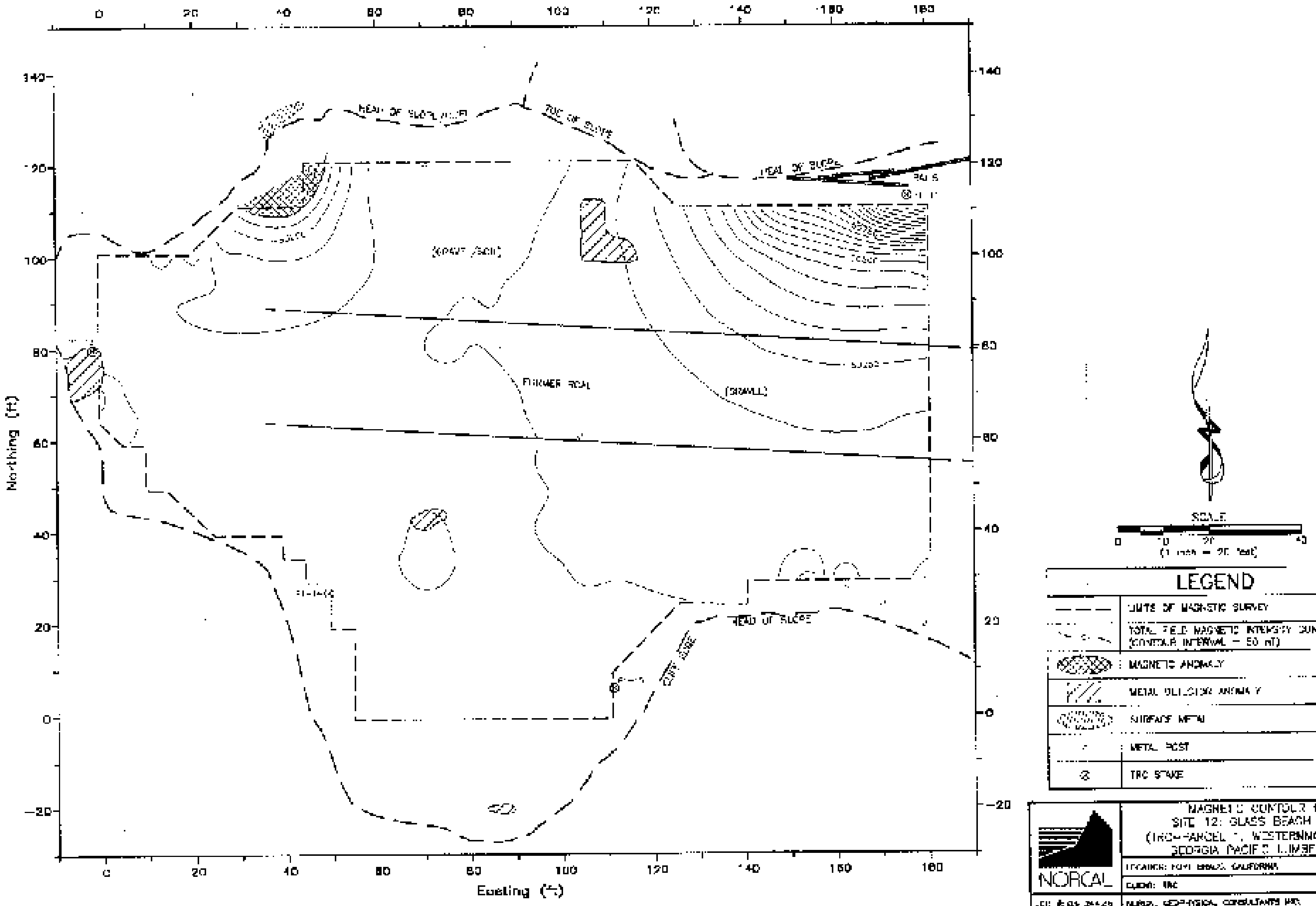
MAGNETIC CONTOUR MAP
SITE 11: FORMER BUNKER FUEL AST AREA
(IRC-4.2)
GEORGIA PACIFIC LUMBER MILL

LOCATION: FORT BRAGG, CALIFORNIA
CLIENT: TRC
NORCAL GEOPHYSICAL CONSULTANTS INC.
JOB #: 03-144.37
DATE: MAR. 2003
DRAWN BY: RANDALL
APPROVED BY:

PLATE
B20



WATER TREATMENT BUILDING
Easting (ft)
Northing (ft)
(SHORT GRASS)
HEAD OF SLOPE
(CAT TAILS/ TALL GRASS)
CONCRETE
LEGEND
UNITS OF TERRAIN CONDUCTIVITY SURVEY
TERRAIN CONDUCTIVITY CONTOUR (CONTOUR INTERVAL = 5 mS/m)
SURFACE METAL/REBAR
UTILITY POLE/GUY WIRE
VALVE
UNDIFFERENTIATED UTILITY LINE
CONCRETE
SCALE
TERRAIN CONDUCTIVITY CONTOUR MAP
SITE 11: FORMER BUNKER FUEL AST AREA
NORCAL
PLATE
B21




## LEGEND

| | |
|---|---|
| | LIMITS OF MAGNETIC SURVEY |
| | TOTAL FIELD MAGNETIC INTENSITY CONTOUR (CONTOUR INTERVAL = 50 nT) |
| | MAGNETIC ANOMALY |
| | METAL DETECTOR ANOMALY |
| | SURFACE METAL |
| | METAL POST |
| | TRC STAKE |

NORCAL

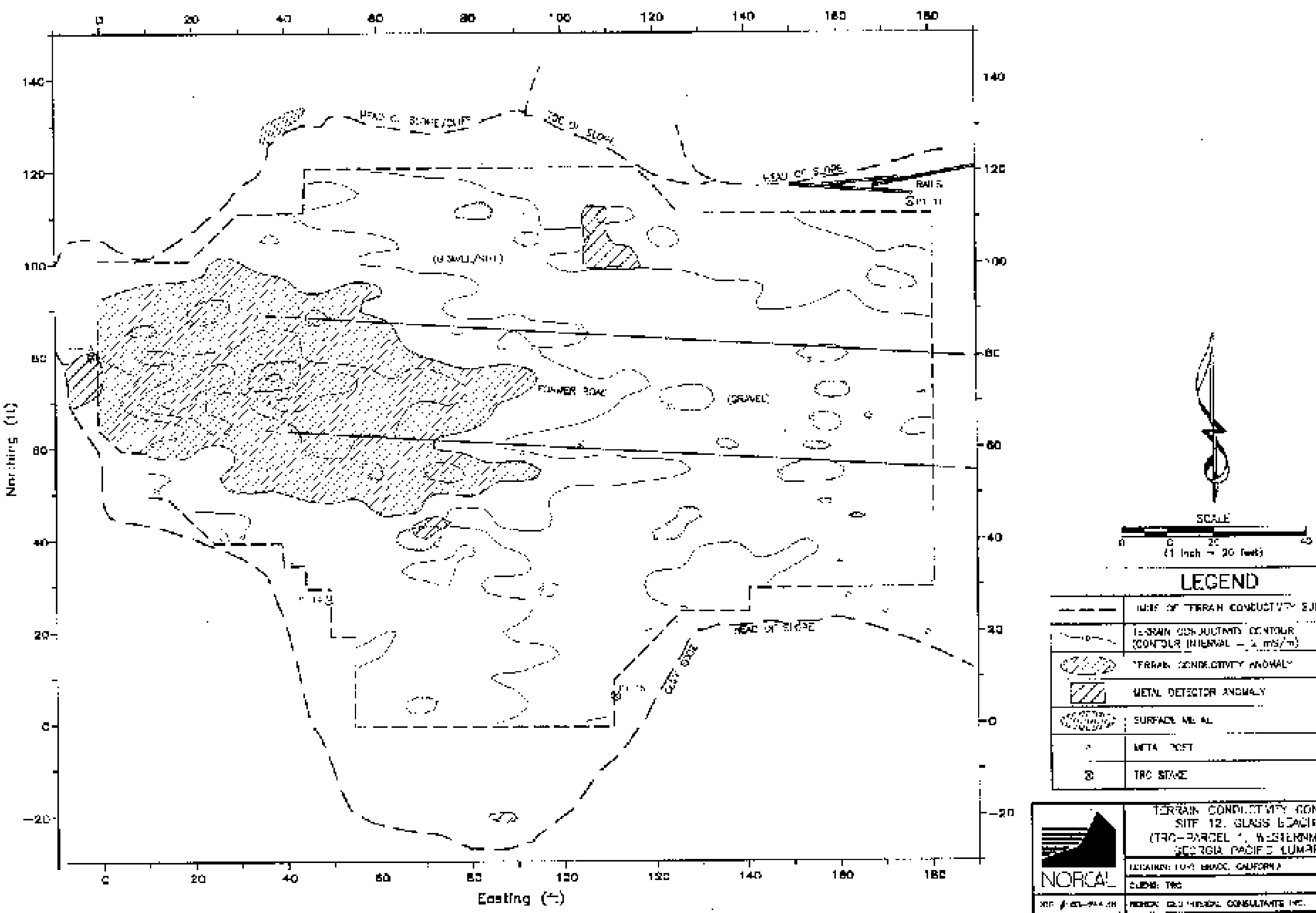
MAGNETIC CONTOUR MAP
SITE 12: GLASS BEACH NO. 3
(TRC-PARCEL 1, WESTERNMOST POINT)
GEORGIA PACIFIC LUMBER MILL

LOCATION: FORT BRAGG, CALIFORNIA

CLIENT: TRC

NORCAL GEOPHYSICAL CONSULTANTS INC.

PLATE B22




## LEGEND

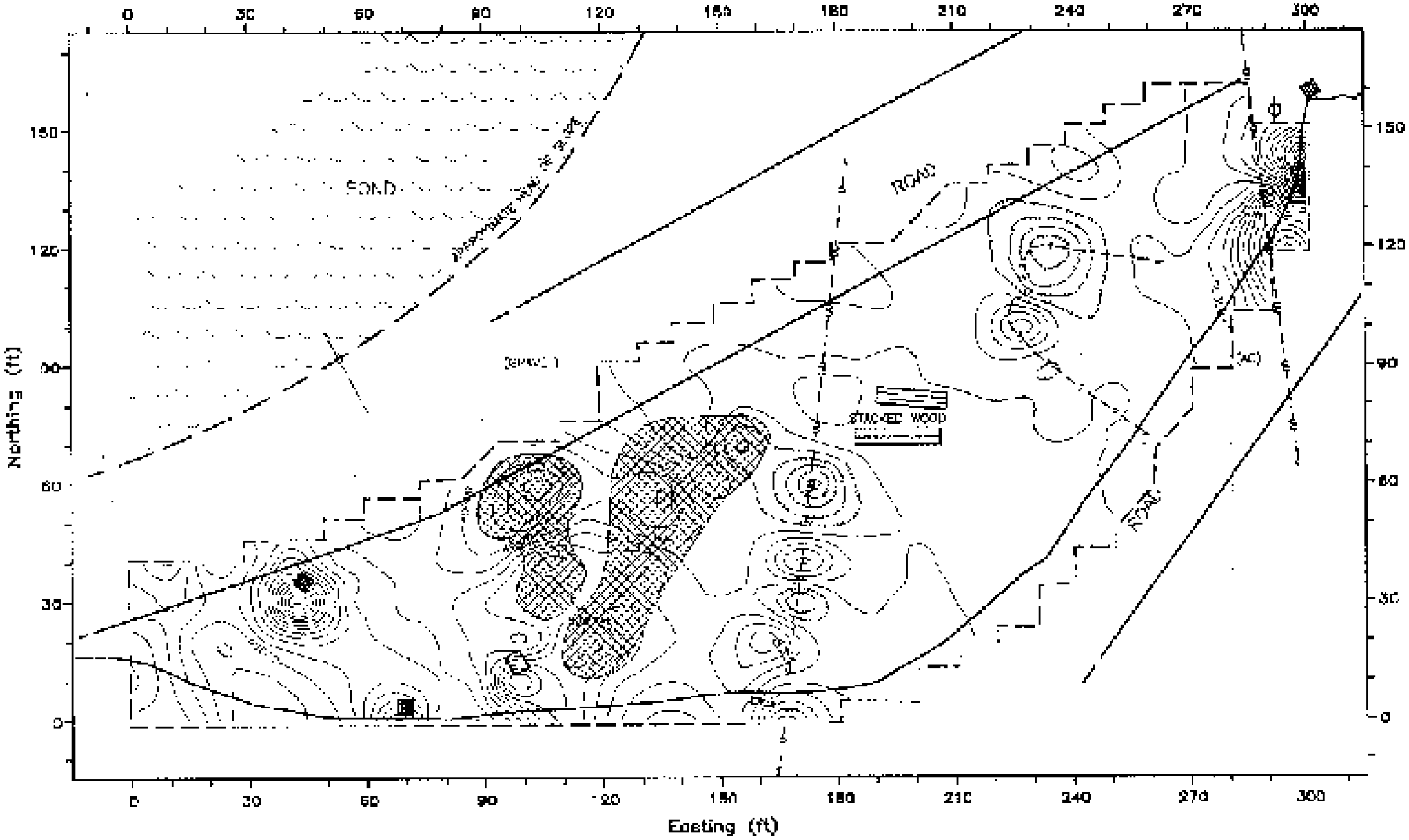
| | |
|---|---|
| | LIMIT OF TERRAIN CONDUCTIVITY SURVEY |
| | TERRAIN CONDUCTIVITY CONTOUR (CONTOUR INTERVAL = 2 mS/m) |
| | TERRAIN CONDUCTIVITY ANOMALY |
| | METAL DETECTOR ANOMALY |
| | SURFACE METAL |
| | METAL POST |
| | TRC STAKE |

TERRAIN CONDUCTIVITY CONTOUR MAP
SITE 12, GLASS BEACH NO. 3
(TRC-PARCEL 1, WESTERNMOST POINT)
GEORGIA PACIFIC LUMBER MILL

LOCATION: FORT BRAGG, CALIFORNIA
CLIENT: TRC
NORCAL GEOPHYSICAL CONSULTANTS INC.
DATE: MAR. 2003

NORCAL

PLATE
B23




## LEGEND

| | | | |
|---|---|---|---|
| — — — | LIMITS OF MAGNETIC SURVEY | —Y— | SUSPECTED UTILITY LINE/ABANDONED PIPE (DUBIOUS) |
| | TOTAL FIELD MAGNETIC INTENSITY CONTOUR (CONTOUR INTERVAL = 100 nT) | | CATCH BASIN |
| | MAGNETIC ANOMALY | | METAL PLATE |
| | METAL DETECTOR ANOMALY | ϕ | STOP SIGN |
| | STORM DRAIN LINE (NON-METALLIC) | (AC) | ASPHALT |
| | UNDIFFERENTIATED UTILITY LINE | | |

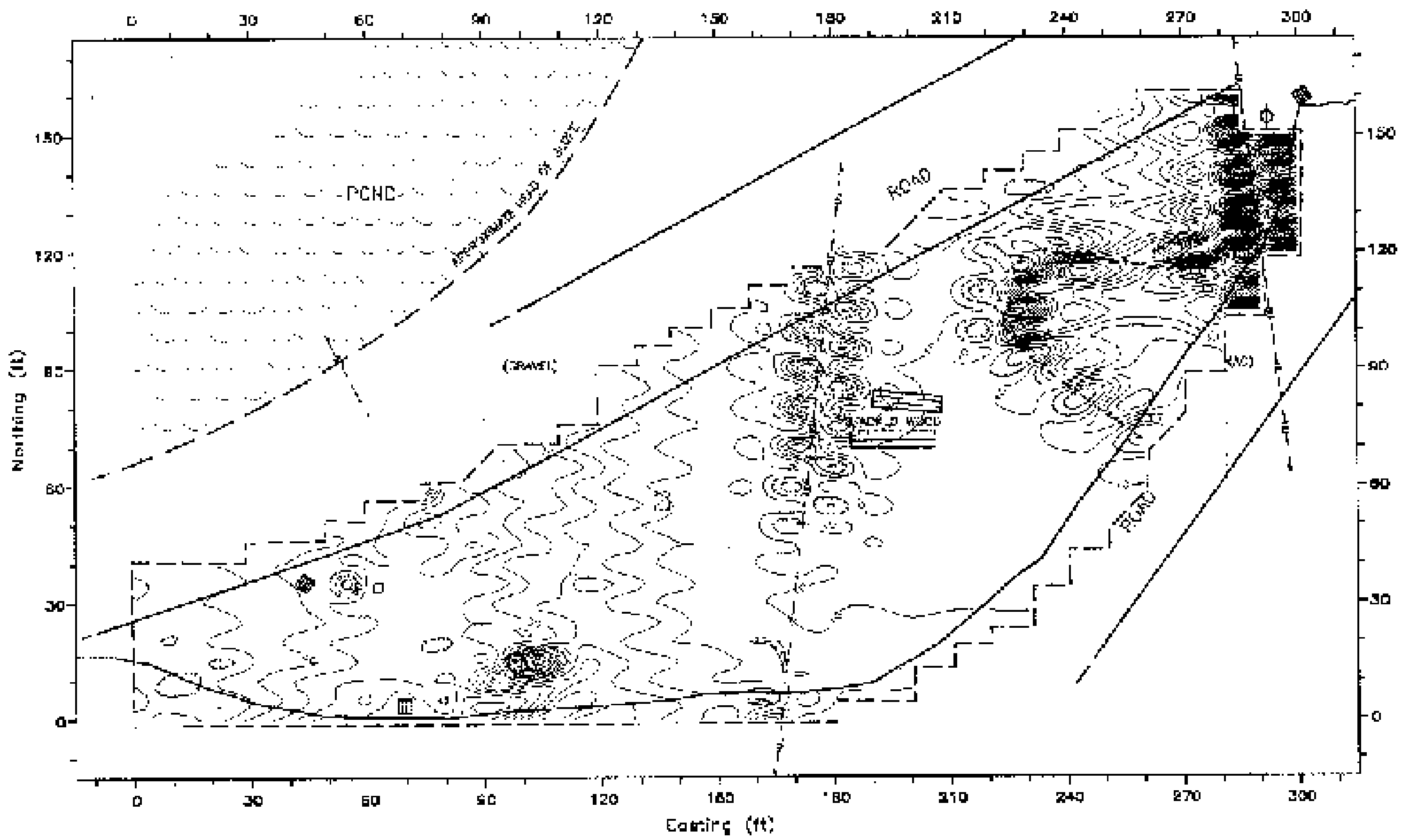
SCALE
0 5 30 60
(1 inch = 30 feet)

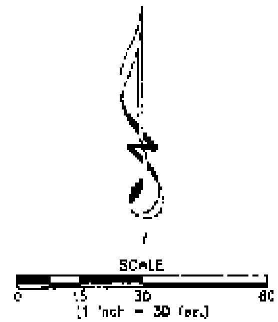
NORCAL

MAGNETIC CONTOUR MAP
SITE 13, SOUTHEAST OF POND (TRC 5.2)
GEORGIA PACIFIC LUMBER MILL

LOCATION: FORT BRAGG, CALIFORNIA
CLIENT: TRC
JOB #: 03-[illegible]
NORCAL GEOPHYSICAL CONSULTANTS INC.
DATE: MAR 2003
DRAWN BY: [illegible]
APPROVED BY: DPJ

PLATE
B24




## LEGEND

| | | | |
|---|---|---|---|
| | LIMITS OF TERRAIN CONDUCTIVITY SURVEY | | SUSPECTED UTILITY LINE/ABANDONED PIPE DEBRIS |
| | TERRAIN CONDUCTIVITY CONTOUR (CONTOUR INTERVAL = ... MS/M) | | CATCH BASIN |
| | METAL DETECTOR ANOMALY | | METAL PLATE |
| | STORM DRAIN LINE (NON-METALLIC) | | STOP SIGN |
| | UNDIFFERENTIATED UTILITY LINE | (AC) | ASPHALT |

NORCAL

TERRAIN CONDUCTIVITY CONTOUR MAP
SITE 13: SOUTHEAST OF POND (TEP-5.2)
GEORGIA PACIFIC LUMBER MILL

LOCATION: FORT BRAGG, CALIFORNIA
CLIENT: TRC
NORCAL GEOPHYSICAL CONSULTANTS, INC.
DATE: MAR. 2003

PLATE
B25